

COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

Weekly Newspaper Second-class postage paid at Chicago, Illinois

Vol IV No 30

July 29, 1970

Price: \$9/year

Second Generation Enthusiasts Cite Cost, Efficiency

By Phyllis Huggins
CW West Coast Bureau

LOS ANGELES Want a computer for 4% to 5% of the original cost? You can get it, and more, and more computers are doing just that.

They aren't just small companies with penny-pinching problems; they are the blue chip corporations with vast computer requirements and the financial

resources to back them up.

The phenomenon is related to the fact that for some jobs, users are discovering that second generation can't be beat and you can buy this vintage of computer for anywhere from 4% to 50% of its original price.

One corporate manager said that he couldn't even justify the new 370/165 in a comparison with available cost performance of the second generation.

There is a reluctance, however, by some users to be identified as supporters of the second generation. The snobbery of "always first with the foremost and the best" still persists, and the chairman of the Board of Computer Sciences Corp. said at a recent conference that the stigma of second generation equipment is disappearing as EDP center costs are rising faster than all corporate costs. By getting a

second-generation computer, he said, the manager can cut his overhead and save a programmer's job.

As Bob put it, "It used to be that you had to have the newest to keep your people since everyone wanted the latest thing. Now it's a question of job survival. This makes a difference."

Not only are used systems to be quoted on their use of second generation equipment, but some

brokers for the systems are equally reluctant. As one said, "I don't want publicity. Business is so good that I don't want more people getting into it."

The most intense cost and performance analysis made by any user contacted was that of a large corporation whose computer complex consists of more than 500 mainframes and 1,000 computers ranging from 20s and

(Continued on Page 6)



Mini Supplement Follows Page 12

One of the first stored-program computers, the huge Whirlwind I, although not as big as any other computer, was the forerunner of today's minicomputers.

In a special supplement, which follows Page 12, *Computerworld* takes an in-depth look at the minicomputer, its history, its current state, and its future.



DEC PDP-8/E

Most System/3 Users Find Equipment Fulfills Expectations With Exceptions

By the CW Technical Staff

According to preliminary results of the CW User Survey, IBM's System/3 seems to be living up to the expectations of most users, although several registered specific complaints about hardware and software.

The majority of the early users are still impressed with the price, hardware reliability, and potential for expansion of the system. Software received a smaller share of the plaudits and a larger share of the criticism.

Growing Acceptance

The most controversial element of the System/3, however, in case after case, is growing acceptance among those using it. Users speak enthusiastically about the easier handling and better use of storage space resulting from the smaller format.

One experienced user went so far as to predict the replacement of the mainframe with the new card.

The few specific instances reported of machine failures were, however, encountered during the system's shake-down period and

all were said to have been quickly resolved.

Software

One System/3 user, who is also using a 360/30 and a 360/40, said he was initially disappointed with his use of the system. He noted that, although he expects to try Assembler when it becomes available, RPG-II already allows him to do "just anything" he expected of the System/3.

Complaints

Other users, however, complained about the awkwardness of handling the 3,000-card RPG compiler, and the 20-minute compilation required when using the relatively slow-speed I/O devices.

Although one user was disappointed by the lack of compatibility and/or capabilities, no one complained about the diagnostic messages provided.

Several users found some problems with the Look Ahead feature, automatic editing of numeric fields, and the compiler's inability to get around a punch block.

On the Look Ahead feature, one user said that the more cards had to be in the precisely the right sequence. If they weren't, he said, there would be no diagnostic warning and the deck might stop reading, but the program would continue into a loop, attempting execution.

The Automatic Editing apparently cannot spot zero suppression on values less than a dollar.

One user said that IBM admitted the compiler was defective in terms of the punch check restart, but said that a correction would be ready shortly. About a quarter of those surveyed had used IBM's Application Customizer Service to get their systems started, but half of them were disappointed. One user has suggested that, with several others, said, "No one who has used it once is going to use it a second time."

Users Lack Experience

Most users of the first System/3s seem to lack experience in the use of computers although a sizable number had

(Continued on Page 4)

all were said to have been quickly resolved.

On the Look Ahead feature, one user said that the more cards had to be in the precisely the right sequence. If they weren't, he said, there would be no diagnostic warning and the deck might stop reading, but the program would continue into a loop, attempting execution.

The Automatic Editing apparently cannot spot zero suppression on values less than a dollar.

One user said that IBM admitted the compiler was defective in terms of the punch check restart, but said that a correction would be ready shortly. About a quarter of those surveyed had used IBM's Application Customizer Service to get their systems started, but half of them were disappointed. One user has suggested that, with several others, said, "No one who has used it once is going to use it a second time."

Users Lack Experience

Most users of the first System/3s seem to lack experience in the use of computers although a sizable number had

all were said to have been quickly resolved.

On the Look Ahead feature, one user said that the more cards had to be in the precisely the right sequence. If they weren't, he said, there would be no diagnostic warning and the deck might stop reading, but the program would continue into a loop, attempting execution.

The Automatic Editing apparently cannot spot zero suppression on values less than a dollar.

One user said that IBM admitted the compiler was defective in terms of the punch check restart, but said that a correction would be ready shortly. About a quarter of those surveyed had used IBM's Application Customizer Service to get their systems started, but half of them were disappointed. One user has suggested that, with several others, said, "No one who has used it once is going to use it a second time."

Users Lack Experience

Most users of the first System/3s seem to lack experience in the use of computers although a sizable number had

(Continued on Page 4)

Unauthorized Access

In the alleged unauthorized use of Metridata's system by Coffman, the FBI affidavits state that Coffman used account numbers and names of Metridata employees, Metridata customer, Structural Dynamics Research Corp., another customer, Prof. James L. Farmer, and the Kentucky Highway Department.

Coffman, the FBI claimed, extracted data from Farmer's files, from Structural Dynamics' files, and from Metridata's own rate ledger accounts, general ledger, and billing records.

According to the FBI, Coffman was the first to begin building a program that would have bypassed Metridata's security system for all of his future access.

Metridata's security system, according to the FBI, was comprised of a telephone line to be connected to Metridata customers and employees and passwords. To gain access to the Metridata computer system, a customer would use an unlisted phone line and a Teletype on his own premises.

Call Traced

Cincinnati Bell traced the call originating from the telephone number as a business line terminating in a Touch-Tone instrument listed for Hyperterm, Inc. of Cincinnati, the FBI affidavit stated.

The Yellow Pages of the Cincinnati telephone book carry an

(Continued on Page 4)

On the Inside

NCR Battle for Local Government Contracts — Page 15

IBM Centers Will Fix Purchased Equipment — Page 13

Business/Industry 15

Communications 12

Editorials 8

Financial 21

Software/Services 11

Systems/Peripherals 13

CAC'S**Computerworld****SALES Corner****COMPUTERS
SPECIAL****1401 16K System****Available
Immediately****360-50 262K
CPU & 1052****1440-8K System
with 1311 Disks****1620-20K
with 1311 III****ALL EQUIPMENT UNDER M.A.****All Types
Punched Card
Equipment**

**Computer
Acquisitions
Company**
P.O. BOX X-1985
ATLANTA, GEORGIA 30308

Data communications ideas?**Talk to Tally.****New Computer
Compatible
Communicator**

Send data error free with Tally 4031 Mag Tape Data Terminals at 120 char/sec. Data can be transmitted and received in standard compatible language with maximum cost effectiveness using these Tally terminals in your existing telephone network. Full error correction routines are featured. As an added plus, talk to any other type of paper or mag tape terminal.

Details? Write or call Tally today, 1800 N. St., Kent, Washington 98031. Phone 206-251-5500.

**POSTMASTER: CHANGE OF
ADDRESS FORM 3579 to be
sent to Computerworld Circula-
tion Dept., 797 Washington, New
York, N.Y. 10016**

Copies Available of Bernhart-Fetter Software Patent**By a CW Staff Writer**

WASHINGTON, D.C. — The U.S. Patent Office has issued, i.e., printed and made available, copies of the first true software patent.

Preliminary approval of the

COMPUTERWORLD

Bernhart-Fetter invention, for computerized "control plotting machine for plotting planar representations of three-dimensional objects," was reported in *Computerworld* April 8.

The program is already in use

in a television commercial for Norelco electric shavers.

Printing of the patent was really a technicality, although the approval could have been recalled at any time prior to actual issuance. Court challenges by potential infringers would be needed before any further action would be taken by the Patent Office.

The issuance culminates a nine year battle by Walter D. Bernhart and William A. Fetter, who were employees of Bell Telephone Co. when they first filed their patent application in November, 1961.

Patent Attorney Gordon A. Sanborn, of Seattle, took up the campaign against Patent Office rejections, and success first appeared possible last November when announcement was made that computer programs would no longer be automatically ex-

cluded from the realm of patentable inventions.

The patent is entitled "Planar Illustration Method and Apparatus, #3,519,997," and is assigned to Computer Graphics, Inc., of Wichita, Kansas. Issue date is July 7, 1970, and copies are available from the Patent Office here.

Applied Data Research Inc., of Princeton, N.J., is awaiting issuance of its patent on the Auto-flow program, for which approval was granted in January.

Computer Graphics received its "notice of allowance" in April, and a patent office official said that the three-month printing delay is "standard."

Computer Graphics President Don H. Aldrich said that the Patent Office had received "a number of requests" for copies of the patent.

556 BPI Tape Inventory Sale

Available — due to excess inventory.
New 1200 and 2400 ft. reels, 556 BPI tape.

Packaging — New reels in new standard size canisters. Reels have metal hubs with clear fronts. Choice of back flange colors unavailable.

Minimum order, 50 reels.
2400 ft. reels — \$8.40.
1200 ft. reels — \$4.20.
F.O.B. destination.

Write **Lafayette Research Company**
One East Wacker Drive
Chicago, Illinois 60601

**Own Your Own
Computer
Business**

NOW, FOR THE FIRST TIME IN COMPUTER HISTORY YOU CAN . . .

. . . own a successful computer business with little or no experience in the field.

. . . make generous profits from growing computer services market that accounts for 73% of computer services bought by companies large and small.

Technological breakthroughs now make it possible for you to own a computer services company for an investment you can afford. Using a central, large-scale computer, SSI lets independent licensees operate their own computer services companies by following simple procedures entering data on easy-to-operate access terminals in their offices. You don't need to know computers . . . the central facility takes care of all technical matters. You simply enter data on your terminal and let SSI's central computer do the work. Serve your business community in the nation's fastest growing industry . . . computerization.

The SSI story is so simple, logical and profitable you will be amazed.

If you are looking for a business of your own that will take you on the inside track for the 1970's, you'll want to see SSI's complete brochure.

If you would like a complete SSI brochure, have a solid reputation in your community and have a minimum of \$22,500 to invest, call or write:

**SEND TODAY
FOR DETAILED
BROCHURE**

Service Systems Incorporated
7151 Envoy Court
Dallas, Texas 75247
(214) 638-4222

EIGHT
THOUSAND
PERCENT
TOUGHER

**Epoch 4: permanent magnetic tape
from Graham Magnetics.**

In computer tape, toughness is the name of the game. The tougher the tape, the lower the dropout rate. It's that simple.

We've just built a tape that's 8000% tougher.

That's right; 8000% tougher than the best competitive tape you can buy. So

tough it's *permanent*.

Hard to believe? Sure it is. But we're ready to prove our claim with a dramatic demonstration—in *your* office.

We'll say it again: 8000% tougher.

Call us now for a five minute demonstration you won't forget. It'll be worth your time. We guarantee it.

EPOCH 4
permanent magnetic tape

GRAHAM MAGNETICS INCORPORATED

Graham, Texas 76046

WATS Phone 800-433-2701

Texas Phone 817-549-3211



FBI Accuses Teenager of 'Tapping' T/S Service Files

(Continued from Page 1)

advertisement for Hypermax, Inc., which says it is a Cincinnati-based time-sharing company employing 100 GE 430.

Besides the trace on June 11, the FBI affidavits stated that other traces on June 20 and 23, 1970, determined placement of the originating call and location in the offices of Hypermax.

On or about June 23, the unauthorized user apparently struck the "Hero 18" key on his Teletype, the FBI stated in its affidavits. On June 20, Richard L. Norris, a Metridata vice-president had a Teletype computer attached to the system to record the unauthorized user's transaction.

When the "Hero 18" key was punched, presumably inadvertently, on June 23, the recording printer typed out Hypermax's address, according to the FBI.

Ernest G. Bianci, president of Metridata Computing, according to the FBI, requested representatives of South Central Bell Telephone Co. in Louisville to conduct traces on the unauthorized user's system, and authorized them to disclose the results of the traces to the FBI.

The first trace was completed June 11. On June 19, agents of the FBI, according to the office's affidavits, called upon the offices of Hypermax in Cincinnati

requesting a Mark Hatfield.

The receptionist at Hypermax, which says it is a Cincinnati-based time-sharing company employing 100 GE 430.

The agents, aware that someone was accessing Metridata's computer system at least once a day, tried to telephone the Cincinnati number—7389, accessing the Metridata system, the FBI affidavits stated.

While that line was busy, agents determined that Mark Coffman was in the offices of Hypermax, Inc., the source of the Cincinnati phone access by the unauthorized user's system.

When the "Hero 18" key was punched, presumably inadvertently, on June 23, the recording printer typed out Hypermax's address, according to the FBI.

The agents stated in their affidavits that they had received the same information that had been seen leaving the building housing the offices of Hypermax enter a resi-

dence at the Coffman address.

The agents also reported in their affidavits that the person had in his right rear pocket what appeared to them to be computer data printout sheets.

Search Warrant

A search warrant was issued to agents for Coffman and for the offices of Hypermax. A warrant for Coffman's arrest was obtained, and he was subsequently arrested.

In the government's complaint against him, it is stated that Coffman gave a signed statement that he did, in fact, commit the acts for which he was charged.

The FBI could not comment on the case, and no one at Hypermax, Inc. of Cincinnati was available for comment.

Coffman was unavailable, though free on \$500 bond.

Ernest Bianci, president of Metridata Computing, when

asked for comment, said that he would prefer, due to the "sensitive nature" of the matter, not to give a statement.

Coffman, if found guilty, faces a maximum five-year prison term, a maximum fine of \$1,000, or both on the Federal charges of transmission of stolen properties interstate by wire, radio, or television. Depending on Kentucky law, he could face additional charges for the alleged theft of the properties.

DP Users in Trouble?

Oops, There Goes a Million Kilowatt...

By Edward J. Bride
CW Staff Writer

NEW YORK—Area computer centers will be among the last businesses to be blacked out, if and when there is a power step-down necessary, the power company said last week.

Consolidated Edison is faced with the dubious task of deciding whether, antiquated power generators, and purchased power contracts in geographic areas, now that a second power plant is out of commission for the summer.

Last week, the Ravenswood 3 plant, in the Borough of Queens, suffered a short circuit in at least four of 48 coils shutting down the facility, which is capable of producing 13% of the area's electric power.

Ravenswood 3 is apparently lost for the summer, as is the Indian Point plant, which provided 4.5% of Con Ed's power. (CW, July 8.)

An official stated that "because of the delicate equipment," businesses with computers would be among the last to be blacked out.

Residential areas would be the first, with high-rise apartment buildings and heavy industry installed near the bottom of the blackout list.

The spokesman insisted that the company is optimistic, but stated that the optimism is based on:

- No hot humid weather.
- No more units failing.
- Ability to purchase power.

Loss of the Ravenswood 3 plant reduces Con Ed's generating power to about 7.7 million kilowatts, including a half-million watts purchased from other utilities.

Expected peak for the summer is 7,725,000 kilowatts, more than is currently available.

The power company has installed, and has already used, emergency diesel generators, but continues to continue this procedure because of the considerable cost involved.

The company said that there has still been only one brownout this summer, and that was on Friday, June 12.

Peak power usage in the North

east is expected in late August.

Last year, there were eight "brownouts," and no blackouts, according to the Con Ed spokesman. Additionally, there were three requests to "wear uses" and two to the general public to reduce power usage.

The spokesman called on New York businesses to cut back on lights, and air conditioning wherever possible, to avoid even brownout let alone blackout conditions.

The spokesman emphasized that measures have been implemented since the massive blackout in 1965, so that a repeat performance should be avoided.

Con Ed itself doesn't talk about reserves any more.

System/3 Users Find Equipment OK

(Continued from Page 1)

'The Univac 9200, NCR Century 100 and Honeywell 300 series, which were unfamiliar with the concept of benchmarking, programs and relied on IBM's service reputation, published performance claims, and especially price to make their decisions.'

The IBM System/3 seems to be finding its way to a group of users who up until now felt that they could not afford a computer.

A Midwest town manager who said that the System/3 enables a small town to have the facilities of a computer system economically seemed to be speaking for many users.

Computerworld

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

555 AUSTIN STREET, MELTON, MASSACHUSETTS 01810 • TELEPHONE 617-332-5888

Yes, please send me COMPUTERWORLD for

Add \$1.00 per year for Canada, \$1.50 for foreign

1 Year \$ 9.00

3 Years \$20.00 Bill Me

Payment Enclosed

Name 31

Your 49 56

Title Co. Name 57

Address 15

City 36 STATE 512-253-2331

Zip 4 8767 1598 1718 19202/22224/252627

Code CW

Return to
COMPUTERWORLD 60 Austin Street, Newton, Mass. 02160

Please Circle 1 Number
and 1 Letter:

YOUR TITLE AND/OR
FUNCTION?

A Operational Management
(Engineering)

B Computer Professional Staff

C Corporate Officers

D Engineering/Management

E Engineering/Scientific

F Production/Maintenance

G Sales/Marketing

H Other _____

COMPANY BUSINESS:

1. Mining or Construction

2. Manufacturing/Computer

3. Manufacturing System

4. Manufacturer/Other

5. Utility

6. Finance

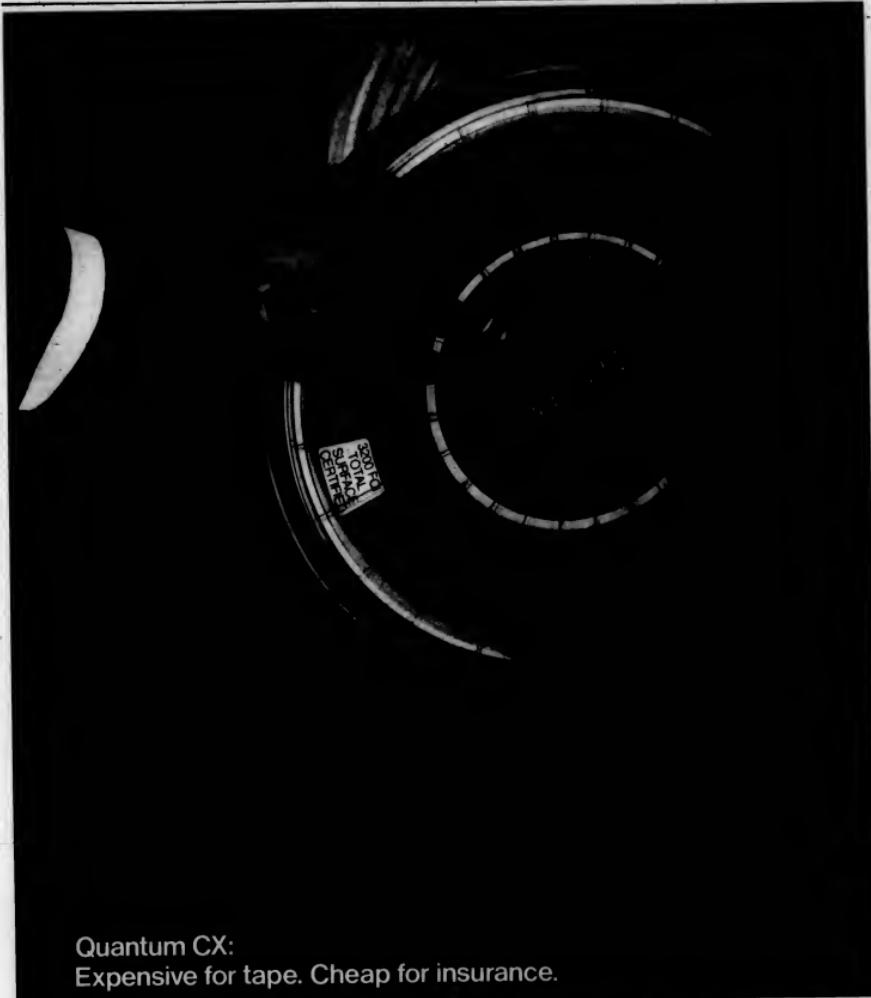
7. Transportation/DP Services

8. Business Service (except DP)

9. Educational/Medical/Legal

10. Government/Military

11. Other _____



Quantum CX: Expensive for tape. Cheap for insurance.

At this very moment, the critical data in your tape files may be deteriorating. Until Memorex Quantum came along, there wasn't much you could do about it.

Now there's Quantum CX. It protects against lost data two ways.

First, with the proven Quantum oxide coating that makes it more resistant to "growing errors" than any other tape. Second, with a new back coating that reduces errors by minimizing debris-attracting static charge. And by preventing back scratches that cause base film debris.

It costs more to make a tape the way Quantum CX is made, so it'll cost you a little more to buy. But remember, the premium you pay really isn't for the tape. It's for the insurance.

For more information on Quantum CX, write: Memorex Corporation, Information Media Group, Memorex Park, Santa Clara, California 95050.

MEMOREX

Second Generation Enthusiasts Cite Cost, Efficiency

(Continued from Page 1)

1130s to 6534s, and over 40 second generation computers of the 1401 and 7000 series class.

This company recently completed its five-year forecast plan and justifies use of the second generation equipment for five to 10 more years. This decision was arrived at for a number of reasons:

One is that the price-performance ratio between 7074s and 360/655 is close to 10 with the 360/655 being the better value, explained: "This means we would be paying 10 times as much for only seven tenths increased throughput. This ratio is based on equipment bought at 4% to 5% of original cost. The highest we have paid is 50% of the new price and that is a third to one saving."

No Qualms

The corporation has no qualms about its planned 5- to 10-year future use of the systems since it feels the central processor

is a solid, stable piece of equipment and the mechanical units such as the typewriter and slow card readers are maintenance-free.

The firm upgrades the system by using the newest accessories with it instead of buying the standard IBM units.

MAI tape drives are used saving \$43,000 over IBM drives on the larger equipment.

For the 1401s the tape drives are \$15,000 compared to IBM's \$37,000.

The manager further pointed out that downtime for the mainframe is less than 1% because diagnostic routines are perfected and the service engineers know the equipment cold. "In addition, the software is all ironed out and I have programmers who have never known a software problem."

There is no reason not to buy well-used computers. "Those that have been run 24 hours a day, seven days a week couldn't have sloppy maintenance, and while these come the cheapest, we find they are good machines to have."

The corporation uses third generation equipment for new work which requires communication capability or large amounts of disk. The second generation is used for standard applications, particularly those that are tape or printer oriented since it finds no benefits from putting them on newer systems.

Second generation users do not feel the second generation as much benefit as do the commercial users because their central processor needs are so great.

One aerospace company contacted said that it has a 90/90 but only because it got it on a lease/purchase option. It is being used for large, complex programs and the user is very satisfied. The user admitted that the 90 was ridiculously cheap but said that it would be let go eventually because it presented problems in training and documentation.

Printers Scarce

One second-hand unit that is not available at particularly reduced prices is the

printer because this is essentially still a first generation unit. Also, the popular IBM 1403 printer has been in short supply.

John Loso, president of Electronic Business Machines, Staten, N.Y., said that one important IBM 1403 product announcement is that of the new printer which should shortly start making the 1403 available at better prices.

There is talk in the industry about mainframe manufacturers using different methods to discourage their users from getting second-hand equipment. Commenting on this, Loso said: "Manufacturers should be subtler to sabotage the used market. They should realize, as Detroit has, that a strong used market means a better new market. You're more likely to buy if you know resale is good."

According to Roger Hughes, president of Commercial Computers, Newport Beach, Ga., many mainframe users are getting second-generation equipment in the emulation mode, thinking they would convert their work, but they haven't. They would rather put staff effort into new work and are finding that it is cheaper to put the emulation jobs back on second generation equipment and run it straight.

Prices Fluctuate

"The price of equipment fluctuates very much," he observed. "It depends upon whether the exact configuration is available. If a new computer needs to be bought, it is new from IBM. This can add \$500 to \$20,000 to the price. Also, if a bundle of machines comes onto the market at once, this pushes the price down."

The IBM 1401s can be bought at 3% to 4% of original cost. Since IBM made 8,000 of them, they are in good supply. The 7000 series computers require more effort in locating since slightly under 1,000 were made.

Users Pay

Ironically, IBM is still leasing thousands of second generation equipment and their users are paying full price.

Bob Hogan, president of Summit Computer Corp., Summit, N.J., cites the example of a customer who had a 1401s leased from IBM — by becoming second-hand computer users they will save \$150,000 over the next three years.

In another case a user has a 360/50 at \$20,000/mo and was using it for nothing but emulation. By going back to a used 7074 he was able to cut rental to \$5,000/mo.

360 INTERFACE PROBLEMS?

The Capital CAM/360/2 Channel Access Module simplifies the task of attaching any 8- or 16-bit peripheral to the parallel port of a 360, models 30 to 195. Speeds to 1 Mbytes. For information, write or call:

CAPITAL COMPUTER CORPORATION
18 Mackay Dayton, O. 45403
(613) 263-4422

Professional Maintenance on Teletypes and other Data Communication Equipment

Enrolling your equipment under a Full Coverage Service Agreement assures the advancement of data errors and the high cost of major repairs. Our professional technicians are ready to serve you on a contract or pay-as-you-go basis.

For further information call (408) 734-4030 Collect.

R. Anderson
Jacobson Inc.

HONEYWELL USERS

A software product just for you!

SCORE

America's #1 COBOL generator is now available for you. Handles simple and complex multiple I/O file management tasks: report generation, conversion, retrieval and file creation.

SCORE is in use at over 100 installations in U.S. and Europe.

Also IBM 360 DOS & OS, RCA Spectra 70, Univac 1106 1108

Why don't you check out SCORE? There will be a SCORE seminar in your area soon. Write or call.

In New York City, contact

Programming Methods Inc.

51 Madison Ave., New York N.Y. 10010
Edward Openhart, 212 889 4200

All other areas contact:

Atlantic Software Inc.

Lafayette Blvd., 5th & Chestnut Sts.
Philadelphia, Pa. 19106
Robert P. Wolk, V.P., 215 925 6424



I would like to attend a SCORE seminar.
Please send details and literature.

Name _____

Title _____

Company _____

Street _____

City, State, Zip _____

Phone _____

Income Bill Lacks Safeguards to Information Access

By Joseph Hanlon
CW Staff Writer

WASHINGTON, D.C. — The Nixon administration has resubmitted its guaranteed annual income plan to the Senate. But in its rush to get money to the poor, it has continued to ignore their right to privacy of computerized personal information.

The new bill contains both computerized data banks called for in the com-

bill (CW, April 22), still calls for extensive information exchange, and still contains no explicit safeguards.

The two new computerized data banks would consist of:

- All 24 million aid recipients.
- The 4 million people who would also have to register for training or employment services.

Two aspects of the bill would result in sharp increases in exchange of informa-

tion. First, joint state-federal administration of the program would mean that all information in state welfare files would be added to federal files. At the same time, much of the information in federal files would be passed on to the states.

Second, the bill states: "The head of any federal agency shall provide such information as the secretary of the department needs for purposes of determining eligibility or verifying other information."

This and other parts of the bill mean that there will be a regular exchange of tax records between HEW and the Internal Revenue Service (IRS), a radical departure from present policy.

Under the bill, a wide variety of information would be collected and stored in government computers:

- Information relating to a person's "suitability" for employment.
- Data on "family and marriage counseling . . . and other services designed to strengthen family life."
- Extensive information now in state

files will be transferred to the federal government. There are presently no rules requiring that such information be relevant to the program, or that it be checked in any way.

Although a person denied aid has a right to a hearing, he then could seek assistance in his disorders, there are many situations where a person might not have such an opportunity.

He might not be selected for a job, job training, or schooling based on such a file. But if he did not know he was under consideration, he might never find out that he lost his right to benefits he would have to return to ask for a hearing.

Some people have been highly critical of the government for its failure to spell out safeguards in the bill. They charge that vague promises of confidentiality will not effectively turn into regulations after the bill is enacted.

In effect, critics declare, the government has stated that welfare recipients have less right to privacy than others.

Mailing List Insecurity Scored

WASHINGTON, D.C. — Rep. Cornelius Gallagher (D-N.J.) Congress' leading advocate of computerized privacy, hit the public insecurity of computerized name lists in hearings recently before the House Postal Operation Subcommittee. Testifying on behalf of his bill (HR 15309), a measure which would put strict controls on handling name lists for "junk mail," Gallagher cited the recent Chicago case (CW, July 14) in which Chicago Envelope and Battatronics (EB) employees were charged with copying computer tapes containing the names and addresses of two million EB customers and selling them to a mailing list broker.

Gallagher declared: "I believe this shocking example typifies the necessity for the Congress of the United States to begin to understand how vulnerable to abuse the computer is."

In Chicago recently, attorneys representing EB filed a petition in Cook County circuit court requesting a date for the preliminary hearing on EB's requested injunction against further use of the reels of tape.

The EB injunction also asks that the tape and all copies be returned, and that

an accounting be made of all profits resulting from the use of the tape.

Gallagher's bill has four main provisions: broker registration; a dissident computerized data bank for people who have indicated displeasure with junk mail; individual name delisting procedures; and source identification of names on each unsolicited letter.

Confessions of a disk pack reject

"I'm good. I know I'm good. Almost everybody says so. And I was sure I could make it at an RCA Disk Pack."

"The 6-high RCA 506. Some of my best friends are 506s. And some are 11-high RCA 511s. The disk pack is either going north or striving toward . . ."

"Anyway, I thought I had it made when I started my

final physical at RCA. They checked my sense of balance. Went over my tracks. Examined the quality of my coating. Gave me the toughest mechanical and electrical tests in existence."

"These people don't miss a thing. I didn't even get to the final test, a chance to prove myself on a computer. Seems I had

a slight case of the run-outs."

"What's a disk pack to do? I'm good enough to be somebody else's disk pack. But all I want to be is another 511. I'm not a 511, I'd want to be a 511."

"Nobody needs a reject. Write RCA Magnetic Products, 201 East 50th Street, New York 10022.

Our disk packs make it.

RCA Disk
Packs



- COMPUTER SPACE
- HEAVY FLOOR LOAD
- AIR CONDITIONING/CONTROL TEMPERATURE
- OPEN 24 HOURS
- BUILD AND DIVIDE TO ORDER

Contact:

Mr. H.O. Cohen (212) 382-2864

COMPUTER ROOM PLANNING MODELS

IBM - HONEYWELL
RCA - CDC
BURROUGHS - NCR - UNIVAC
OVER 1000 MODELS - 1/4 in.
36 Items - '900" KIT - \$59

"VISUAL"

INDIANOLA, PA. 15051
(412) 828-8211

FREE
SOFTWARE

DATA

DW Data Usage

Editorials

Worthwhile DP Project

The attitude taken by government officials in the recent hearings on a national environmental data bank is not untypical: nothing to upset the applicant, nothing to make us think or work harder.

This is one data bank that should be established, one that could carry the slogan: the less privacy the better.

At least three different officials presented prepared statements calling the proposal "premature."

Sounds "late" to us.

We agree with the Murray State faculty member, who stated that there is no alternative to the data bank, and that computers can be used to manage it effectively.

We also agree with the officials of the state of Maine, who said, "The time for talk is past; the time for action is long overdue."

Letters to the Editor

Names Similar, But Different Products

Due to the similarity of our company name, Century Data Systems, Inc., to the NCR Centurion 100 computer system, some misunderstandings are occurring with our customers and potential customers due to the article CW published May 27.

Although Century Data Systems, Inc. is one of the largest suppliers of high performance disk drives to the minicomputer 2314 market and in the OEM market, we do not presently supply NCR with our drives.

One of the prime design goals of our equipment was to eliminate the possibility of head crashes which, as you allude, critics point out is a major problem with NCR and other manufacturers as well. We have shown that this problem can be minimized to almost an insignificant level.

W.J. Sewalk

Vice-President, Marketing

Century Data Systems, Inc.

Anaheim, Calif.

Matrix Operations Fundamental to APL

In your June 3 edition, Elaine Bishop's article entitled "Survey Shows Basic Often Limits User's Flexibility" ends with the statement (by two anonymous sources) that "...the lack of ability of matrix operations (a useful feature of Basic) in APL might some day bring about a switch to that language."

Please be informed that APL derives its power from its array-oriented definition and implementation.

All mathematical operations are applicable (without any explicit MAT statement) to arrays of any dimension. For this reason, matrix operations are not only available, they are fundamental to the very definition of APL.

For the further clarification of these and other non-APL users,

consider the following example of the matrix product of matrices A and B (of conformable dimension):

FORTRAN

```
.....
DO 11 I=1, M
DO 11 J=1, M
C(I,J)=O.O
C(I,K)=K
1 C(I,J) = C(I,J) +
A(I,K) * B(K, J)
.....
END
```

APL
 $C \leftarrow A \times B$

From the above, it is evident that APL has full matrix capability, is easy to use, and is more mathematically oriented than procedural languages such as Fortran or Basic.

As far as certifying Computerworld's claim that it is difficult to present all the facts, I trust you will publish this letter and correct Elaine Bishop's statement.

S.M. Raucher
 Washington, D.C.

D.C. Data-Line

Unemployed Can Turn to Job Bank

By Alan Dratell

CONTRIBUTING EDITOR

WASHINGTON, D.C. — The data processing specialist out of work in metropolitan Washington can find assistance from the job bank, one of 42 such Department of Labor computerized operations throughout the country. The Washington job bank covers the District, suburban Md. and N. Va. lists between 4,500 and 6,000 jobs daily that are available in the area.

The positions offered range from busboy to systems analyst, and in the first nine months of operation, thousands of referrals of applicants seeking employment have been made. There are no exact figures available for the period; however, in the first four months of operation, better than 5,000 referrals were made.

Computerized job banks were introduced in 1968 when Baltimore became site of a pilot project. Since then the banks have been extended to 41 other



Alan Dratell

cities, providing service for more than 35% of the nation's labor force.

Expansion of the job bank was a key campaign pledge of President Nixon in 1968, and the Department of Labor says that at least 24 additional banks are expected to be operational by October.

While professional-type workers are served by the banks, the thrust of the effort is toward the unskilled, the disadvantaged, and those who have some of the skills necessary for employment but who need some type of counseling and aid to get them to the employable status.

Manpower training is a key element of the job bank program, and according to Adolph J. Slaughter, director of the Office of Community Relations and Information in the D.C. Manpower Administration: "The job bank is more equitable; it doesn't see black or white."

A Department of Labor official earlier said: "It is not uncommon to find that the placements of manpower trainees are as much as doubled since the advent of the job bank, and that employers in large numbers who did not previously list their job openings with the public employment service are now turning to it in confidence." In Washington, 30 to 40 hard-core unemployed are placed each month.

In its simplest terms, the job bank functions this way: after a job order is taken over the telephone in an office of the U.S. Employment Service, it is entered into the computer to be

printed out in the job bank book — a computerized listing showing openings and training opportunities in the area.

In Washington, a service bureau, Computing and Software, Inc., in McLean, Va., is used. The bureau has an IBM 360/30 with 65K core and three 2311 disks, four 9-track tapes and two 7-track tapes.

Eighty-four copies of the job bank book — averaging 220 pages — are printed and updated daily and sent to various Manpower Administrations in the metropolitan region for use by counselors. Professional-type employees are given direct access to these books. The employment service offices receive and post notices of jobs available in other areas of the country.

A majority of the jobs offered in the District area are part-time, temporary or seasonal, according to Maurice Hill, director of the Office of Employer and Technical Services, and Washington has not been as hard hit by the current employment recession as other cities in the nation.

The program here, according to Hill, costs between \$20,000 and \$30,000 a year. Although the Washington operation has not come up with any figures indicating savings from the computerized service, Hill said the bank has released "professional people to do professional work and left the clerical tasks to the computer. Before the job bank we did everything by hand."

In some test areas in the nation, such as Utah, more sophisticated uses of the computerized service are in vogue, including the matching of men and jobs electronically. "The ultimate," according to Secretary of Labor James D. Hodgson, "is to have a job bank capability in each of the 2,100 employment service offices in the nation, linked statewide, regionally and nationally." A fully computerized network is sought by 1976, and according to a labor official this could mean use of on-line terminals.



Caught in the Middle

Answer to Cobol Overhead - Step I: Cost-Accounting

Now that the idea of waiting until the fairy godmother comes around and presents us with a wonderful Cobol overhead-free compiler has been seen to be a bit unreasonable, the harder question comes up as to just what can be done to cut Cobol overheads.

The answer as far as I see is not very straightforward, at least not for most computer installations.

Better Cobol does not come free, and an installation is going to have to work for it, and that work is going to have to be paid for.

Unfortunately, while the budgets of computer installations are quite substantial, they are normally set up as being service organizations. Money is provided for salaries, overheads for the payroll, for supplies etc.

Work is done on the computer for the various departments, the charges are allocated according to some agreed formula. This shows up in the computer budget as a departmental charge which has the effect of approximately cancelling out the hardware, etc. costs, and everyone goes home happy.

The key here of course, is that formula. The way that the charges go to the department are calculated.

Generally it is simply taking the amount of machine time used for the department, multiplying it by some magic number, and there's your answer. In somewhat more sophisticated cases it makes separate charges

for programmer time, printing on the fly, or other local interest points.

Practically never does it take into account the value of the work done instead it bases itself on the cost.

Efficiency Restricted

This type of accounting is currently holding back the progress

Alan Taylor, consultant, writer, and former editor of *Computerworld*, is president of Computer Management Consultants Corp. of Framingham, Mass.

of computers, because it makes provision for the installation to spend money on becoming more efficient.

In such a case, if the installation programmers turn around, put in 60 hours overtime, and cut the running time of the major job in half, the figures for the account of the department will show that now they are only doing half as much work on that job as before!

Money has certainly been saved by the corporation, but the benefit has accrued to the user-department (which did absolutely nothing) and not to the computer department.

Resources Allocation

This is important – because when it comes to allocating resources management will use the figures from the accounting department to determine policy.

So, if you want to gain ade-

quate resources to do anything substantial inside your department, then you are going to have to see that if you do some good, then it is going to be attributed to the right source.

Then there is the first action that you can take. Pick the most heavily used run that is currently on your computer system, and imagine that it is cut in half. Then go down to some friendly soul in accounts, and with his help work that into a set of figures, including intermediate (hypothetical ones, of course) and see in just what column it ends up.

Then take a second step. Imagine that to make this saving you had to spend 10% of the annual saving, and that you spent it in the month preceding the saving. Now, go back to the same friendly accountant back that into a second set of hypothetical accounts. Then look at the results.

Probably they will say that the more efficient you run that computer system, the worse the management picture of your department will be!

Ask Accounting's Help

Then comes the 'key' moment – because this is where if you have chosen the correct fellow down in accounting that you get an absolutely needed ally. Don't get annoyed and say "I'm not asking him to do better – I'm just sit back, and ask your friend just what is modern accounting for?"

Ask him to tell you about his theories and ideas as to how accounts 'could', and should be used. Suggest that you have

listening for quite a time. Most accountants believe that the profit of the accounts can directly influence the profit of an organization – but they all too often have the opportunity to set up a set of really good accounts. Many of them want to, but the current set in the firm are not too bad, so why disturb them?

You may have provided the answer. If you get him to compare the cost of the computer department to the annual profit of the firm, you will have given him the final touch to answer. You may have shown him that while efficiency in the computer department can make substantial contribution to that annual profit, yet the way the accounts are currently set up hinders, rather than helps the computer department in becoming efficient. Then you can together get working on developing a better set of accounts.

© Copyright 1970 Alan Taylor. Reprinted by permission of the author. The views expressed in this column do not necessarily reflect those of Computerworld.

The Taylor Report

By Alan Taylor



hard somewhere that accounting is not just to know what money there is in the bank – but it has a vital management function.

If you have chosen correctly, you will still be sitting there

ARE YOU PLANNING YOUR FIRST COMPUTER?

If so, you can cut computer costs by sharing a computer. For further information write: President, The Silber System Inc., 430 East 56th Street, New York, New York 10022.

THE SILBER SYSTEM INC.

COMPUTERWORLD

THE NEWSWEEKLY FOR THE COMPUTER COMMUNITY

We're Waving Our Flag.

With good reason.

More advertisers bought more advertising space in *Computerworld* than in any other computer publication for the first half of 1970.

Computerworld ran 854,070 lines of advertising. Compared to 550,270 lines in the leading monthly publication. A fact we're proud of.

We think it has a lot to do with our banner. And the byline on it.

Computerworld is the only newsweekly, edited specifically for computer users, that publishes once a week. Every week. Fifty-two times a year. And the

only computer publication that can deliver your message to more than 35,000 paying subscribers the same week your new product and services become available. And every week thereafter.

All at the lowest CPM. And highest all-paid circulation of any computer publication.

Now that we've finished our flag waving, we'd like to thank our enthusiastic advertisers and responsive readers for helping us make this our best year ever – by wishing you many happy returns on your *Computerworld* advertising.

(617) 332-5606



COMPUTERWORLD

Pioneer Conference Gives Few People Few Answers

By J.H. Bonnett

CW European Bureau

LLANDUDNO, N. Wales - What have the pioneers of computing to contribute to tomorrow? This was the fundamental question posed by a two-day seminar addressed by 10 of the best known men in the computer field over the past month.

Are their ideas still fresh? What can we learn from their experience? These were the questions being asked, and to which we can have no meaningful answer as the conference turned to be one of the most bizarre events ever held in the name of the computer.

Over 2,000 invitations were sent out by the organizers, Computer Consultants Ltd. and it was claimed that up to 2,000 people would attend.

This claim worried the residents of this sleepy seaside holiday resort, a tribute to the endurance of the British and now used, mainly by the old and those unable to face the pace of the Costa

Bravia.

They need not have worried. On the opening day organizer Richard Williams admitted that there were only about 60 paying delegates who had come to see sessions that revealed more than 30 miles out of a total audience of 45 or so who might have paid. The location of the event was changed from the venerable Pier Pavilion to that of Caesar's Bar, a sort of night club on the ground of the Grand Hotel, next door.

The seminar was better than the accompanying exhibition, held in the Winter Garden Ballroom, which attracted about eight exhibitors including Univac, General Electric, and ICL. Of these, ICL was the wisest; it wasted no manpower, never staffed its stand, and relied on a display of photographs.

The exhibitors who were present soon became disengaged; one claimed that in the first three days only 17 people attended.

At the conference hall the speakers ploughed on regardlessly and tried to break the ice was Professor D.B.G. Edwards, veteran of the Ferranti MK1, Mercury and Atlas, he is now engaged in the development at Manchester of a new machine, MUS, which many believe will be the prototype of ICL's next range. For the future he saw the greatest projects in the use of memory techniques, a subject to prove popular with several other speakers.

Ed Berkeley took as his theme "Sense and Nonsense in Computer Applications," and after a lengthy review of his own part in the history of computers—a course he has been giving to students—said one must be concerned, for it is their responsibility. He asserted that computers do think, and that computers will translate from one natural language to another, and that every defined individual operation can be done by a computer

better and faster than by a human being, and that it is possible for a computer to make decisions more wisely than a human being.

The first morning was concluded by a speech from Dr. J. Presper Eckert who reviewed the history of computer and memory generation, and predicted that memory costs will drop by a factor of 10 over the next five years and that the 100 megabyte of the plated wire type will be built experimentally by Univac will be in common use, LS1, in the view of Eckert, is still anything from two to 10 years away.

Dr. F. Filippini, director of GEMS Italia, presented a historical account, in Italy, he said only 1,500 machines are now installed and 65% of these are small, and only 5% large, though the trend was towards larger machines. If machines currently installed in Italy, he said 10% are in universities, 10% in public administration, 20% in banks, and 50% in manufacturing industries.

Cadr. Grace Murray Hopper pointed out the mistakes made and what must be done to correct them. A prime mistake, she asserted, has been that of the mathematicians and scientists in isolating the user from the machine in the past.

For the future, she said, new ideas are not welcomed with open arms and a million dollars, but must be promoted by any technique available. Off the terminal scene she said: "Management will never do it themselves—they won't even get their own telephone numbers."

She looked forward to a future making full use of modularity, and many small computers, and the modern high-speed terminal as a dinosaur. In terms of software she said: "We must get rid of the file drawer concept if we are to make proper use of the large stores now becoming available."

Other speakers present included John Hargraves of IBM UK, T.R. Thompson, a veteran of the Cambridge Edc project and of the Leo computers, and Dr. Konrad Zuse. Summarizing these points, no one could feel that computing is anywhere near its final destination, though their individual views on the future vary and they emphasize that we of the present have a lot to learn from the past and that all the ideas of the past have not yet been exploited.

IS the international marketplace the key to success in the computer industry at a time when things aren't going so well here at home?

The current Gray Sheet probes this concept as it examines the world of the computer outside the U.S. Send for the current issue -- \$8. Or, go ahead. A year's supply only costs \$75.

EIDP Industry report

Department N-17
60 Austin Street
Newtownville, Mass. 01860
617-969-4020

If we make you wait... we'll pay the freight.*

Buy or lease our VISTA I alphanumeric display terminal in any model. If we don't ship it to you within 30 days A.R.O., we'll air freight it--FREE!

So, if you need a CRT terminal that's fast, silent, easy to read . . . that replaces a model 33 or 35 teletype with far more efficiency . . . that's compatible with any mini-computer . . . that's a completely compact, stand alone unit with keyboard, video presentation, control and refresh electronics—plus a Data Phone interface and power supply . . . AND, if you want it NOW . . . JUST MAIL THIS AD.

* THIS OFFER EXPIRES AUGUST 31, 1970

Specifications

Model	A	B	C	D
Characters/line	32	32	64	64
Number of lines	10	20	10	20
Character size (nominal)	15' high, 10' wide			
Line spacing	45 character height			
Character spacing	40 character width			
Character format	5 x 7 dot matrix			
Character set	64 character ASCII			
Cursor	Non-destructive blinking underscore			
Refresh rate	50/60 Hz			
Memory	MOS shift registers			
I/O rate	110-2400 BPS standard. High speed serial or parallel optional			
Communication interface	RS 232C or current loop			
Parallel interface	TTL logic; bit parallel; demand-response code			
Power	125 watts. 110-220 volts. 50/60 Hz			
Size	15' high, 17' wide, 27' long			
Weight	65 pounds			

PRICES	PURCHASE	MONTHLY LEASE*
VISTA 1A	\$1,495.00	\$ 78.75
VISTA 1B	\$1,995.00	\$ 97.50
VISTA 1C	\$1,995.00	\$ 97.50
VISTA 1D	\$2,495.00	\$116.25

*includes maintenance for three years plus

YES!

I went to lease purchase the following VISTA I CRT terminals within 30 days A.R.O.

I understand that if I have to wait . . . you'll pay the freight, air freight.

MODEL	QUANTITY	UNIT PRICE	TOTAL PRICE
<input type="checkbox"/> VISTA 1A			
<input type="checkbox"/> VISTA 1B			
<input type="checkbox"/> VISTA 1C			
<input type="checkbox"/> VISTA 1D			

Total Price \$

Please check one 110 Baud 300 Baud Current Loop

MAIL TO: INFOTON INCORPORATED

Second Avenue, Burlington, Mass. 01803

Mail too slow? Call (617) 272-6660

Sales and Service in United States and Canada represented by MAI



Command Functions

- Cursor control — up, down, right, left, home
- Start blank, stop blank
- Erase screen

Interfaces

The standard interfaces allow connection to modems up to 2400 baud. Available as options are serial or parallel data interface up to 800 characters/second synchronous, or up to 1500 characters/second in a demand-response mode.

Operating Modes

- I/O
- Full duplex or ½ duplex
- Format
- Roll page

Options

- Hard copy output
- Magnetic tape input and output
- Card or badge reader input
- High speed data transmission up to 1500 character/sec

SALE TERMS

Terms of sale for the company's products are net 30. Shipment will be made FOB Burlington, Mass.; prepaid, best way unless otherwise specified by the customer.

WARRANTY

Ninety days warranty on parts and service. Twelve months on parts manufactured by Infoton. Manufacturer's warranty on all other parts (no less than ninety days or more than twelve months).

TERMS

Name _____

Title _____

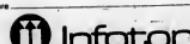
Company _____

Address _____

City _____ State _____ Zip _____

F.O. # _____

Authorized Signature _____



July 29, 1970

Page 11

DNA 1130 Sort Package Gives File Structure Choice

FLINT, Mich. - IBM 1130 users are said to have almost complete choice of file structures, extreme flexibility of sort-key format, and exceptional speed with a sort package available from DNA Systems Inc. for less than \$500.

The sort is a joint development of DNA Systems Inc. and Computer Pty. Ltd. in New Guinea, a DNA spokesman said.

The package is capable of handling Fortran organized files, RPG sequential files or files created under DNA's Disk Control System. However, all the necessary input and output records, a DNA spokesman noted, and Iam files cannot be sorted with the package.

A maximum of 430,000 records can be sorted at one time on an 1130 with a single disk drive. A user can sort an entire process 509,440 records. In either case, DNA said, an unlimited number of sort-keys can be used.

Sort-Keys

The sort-keys can include sin-

gle- and/or double-word binary integers, or part-word binary patterns of from one to 32 contiguous bits, which may be spread across three consecutive words.

Other possibilities include floating point, standard or extended precision numbers, or Fortran A1, A2, A4, A8, and A16 characters, and Cray A3 and Commercial Subroutine D1 or D4 data of any length can also be used, as can RPG A2 or RPG packed data in any length.

According to DNA, the package's speed allows a 12,000 record file, with a 16 integer sort key, to be sorted in 10 minutes. Partially ordered input data and/or larger core size would improve this performance.

One user said he used a mixed alphanumeric sort key to sort 4,000 record Fortran file of 24-word records and completed the job in two minutes.

Functionally, the basic package

is a stand-alone sort that uses control cards to define the file organization, identification, record size, file size, sort-key, and other necessary parameters.

Two Options

DNA can provide two modifications to the basic sort. The spec-file option allows the user to put his sort specifications into

a file, and to call a subroutine to initiate the sorting.

The second option, roll-out, gives the user the capability to roll out core to a save file set up by the user, to use the file as a quick core from the save file, and continue execution of the user's program program at the next instruction.

Cost of the basic stand-alone

sort package is \$495 under a license agreement. The callable spec-file and roll-in/roll-out options are available for an additional \$45 each, according to DNA.

Electronic Computer Pty. Ltd., is on Boio St., East Brook; Papua, New Guinea. DNA Systems Inc. is at 2415 W. Stewart Ave.

EUROPE TODAY

Issue 12. France had over 5,000 computers installed at the end of 1969. More than 50% of these were small card-based systems: Bull-GE holds 25% of the total French market. These two points - plus others - are studied in Issue 12 of *EDP Europa Report* which concentrates on the French scene and the Honeywell-GE merger.

Order your copy of *EDP Europa Report* Issue 12 now, at the non-subscriber price of \$5 (£1. 15s) USA, \$3.35 (£1. 8s) Europe and have its full value accredited to an annual subscription for 24 issues \$65 (£27) if taken up within two months. Orders may be placed at either of the following offices.

EDP Europa report

DEPT. C1, 60 AUSTIN STREET, NEWTONVILLE,
MASSACHUSETTS 02160 U.S.A.
59 GRAYS INN ROAD LONDON WC1X 5TL ENGLAND

Pssst... don't tell the big guys

But PEC makes more tape transport models than both of them combined.



Surprised? PEC makes over two hundred models in three reel sizes, 7, 8½, and 10½ inch. Choose from tape speeds and densities of 6 to 37.5ips at 200, 556, 800 or our new 1600cpi in synchronous versions. In 9-track or 7-track dual density with read-after-write, read/write, write only or read only. Formatted and unformatted. Or our incremental units with asynchronous rates of 0 to 1000 steps per second. PEC offers the industry's most complete line of tape transports. All available from our huge new plant. For more information, write to Peripheral Equipment Corporation, 9600 Franklin Avenue, Chatsworth, California 91311. (213) 882-0030.



Shhhh...

PEC

2 Ennis Brandon Services Designed for CPA Support

FORT WORTH, Texas - Accounting firms, whose practice includes financial services for small- and medium-size businesses can now use either of two services from Ennis Brandon Computer Services (EBCS).

The services, EB 20/200 and EB 30/210, are designed to provide only the essentials required for small business needs, so that the CPA can give his clients the benefits of a computer service at a cost "well under that of manual work."

Both services provide, as standard reports, a statement reflecting balance, balance sheet, and income statement. EBCS added that standard options, at no charge, include dollar rounding and percentages on the income statement.

Extra cost features include preparation of audit reports, wage and tax report and preparation of W-2 and 941-A forms, in addition to preparation of the balance sheet and income statements on white bond.

The basic difference in the two services, EBCS explained, is in the form of the input data. Under EB 20/200, the Brandon Center prepares the data from the user's source documents.

EB 30/210, on the other hand, is for the firm whose volume justifies a keyboard or key tape unit. In this case, preparation costs at EBCS are virtually eliminated.

The services can be used interchangeably with each other, and they can also be used with the EBCS General Ledger System, Brandon said.

The company estimates that processing for the CPA services will be under \$10 for each of the accountant's clients. A four-day turnaround can be considered

normal, EBCS said.

Ennis Brandon Computer Services' headquarters are at 2840 Walnut Hill Lane.

Packages Offer Cobol Support

SACRAMENTO, Calif. - Cobol users can gain documentation, housekeeping, and report formatting support from a series of packages, Easyflow, Date/Sub, and Check-Pro, available from Rodger, Rogers and Kirkman (RRK).

As aid to documentation, Easyflow generates management level flowcharts based on input data developed from rough flowcharts. Logic changes, shown by simple changes in the input documents, will generate new flowcharts, RRK said.

The Date/Sub subroutine is designed to convert dates back-and-forth, as desired, between the Julian and Gregorian calendar. This date can also represent the day of the week on which it occurred, according to an RRK spokesman.

Check-Pro is said to convert any dollar amount to the equivalent alphabetic spelling. With values spelled out, RRK said, checks cannot be tampered with or misinterpreted.

Check-Pro can be used on any CPU that supports Cobol, the developer said. It requires 1.5K to 2K bytes of storage and costs \$95.

The Date/Sub subroutine also sells for \$95. The Easyflow purchase price is \$225, including complete documentation and user's manuals.

Rodger, Rogers and Kirkman is at 2110 K St.

FCC Seeks Comments on NAS Interconnection Report

By Don Levitt
CIV Staff Writer

WASHINGTON, D.C. — The FCC would like to hear reactions to the interconnection report recently submitted to the commission [CW, July 11] by the National Academy of Sciences (NAS).

The report was based on studies authorized by the FCC as an outgrowth of the Carterfone decision in 1968. NAS told the commission that the carriers have been slow in providing the devices required to connect non-

carrier equipment with the phone network. On the other hand, the report noted, inclusion of private branch exchanges and non-Bell terminals might be difficult because of differences in equipment design.

The academy also highlighted the lack of information exchange between carriers, users, and others involved in interconnection. Apparently in response to that point, the commission has now asked for comments on the "significant technical findings and conclusions" contained

in the report.

Copies of the report are available from the National Academy of Sciences, 2101 Constitution Ave., for \$4.50 each.

The FCC has said that it will

delay taking any action on the report until it has heard from all interested parties, including an independent consultant that the commission itself has retained to analyze the NAS findings.

Written comments (an original and 14 copies) are requested by Sept. 1, the commission said, and should be addressed to the Chief, Common Carrier Bureau, at the FCC.

Whitehead Expected to Get OTP Nod

WASHINGTON, D.C. — The Senate's expected confirmation of Dr. Clark Whitehead as director of the Office of Telecommunications Policy (OTP) brings that office, added to the

White House staff earlier this year, closer to full operation. Who the teleprocessing user is still unclear. None of the announcements to date have

made specific reference to data transmission questions. Whitehead's background gives no clue as to his thinking in that area of telecommunications policy and he was unavailable for comment.

Whitehead has been on the White House staff since the start

Communications
of the Nixon Administration, working on communications, and international and domestic satellite policy, and drafting the Administration's reorganization plan under which OTP came into existence.

Whitehead agreed to take on the OTP directorship only after his first choice for the job, William Niccannon of the Institute of Defense Analysis, ran into opposition.

Although the OTP is supposed to be an advisory body, its impact could be significant. When the office was first proposed, Whitehead felt that OTP "will not affect the responsibilities and authority of the FCC." On the other hand, White House "fact sheets" distributed at one time indicated that OTP would prepare "administrative recommendations to" and have "effective cooperation with" the FCC on "policy matters."

Intentionally or not, "administrative recommendations" are almost sure to affect the FCC's work.

Sangamo Has New Modem

SPRINGFIELD, ILL. — A new modem has been developed by Sangamo Electronics for originate-only Teletype applications to 300 b/sec. full duplex on the data network via the Bell data coupler F57951 or 1000A.

The Bell Sangamo 1003A or 101C modems and small in quantity for under \$200, the company said.

Sangamo is at P.O. Box 3347.

I.B.M. USERS
WEEKEND SPECIAL RATES
THREE LARGE SYSTEMS
GUARANTEED BLOCK

TIME

(1) \$45.00 PER HOUR

360/400 131K

870/900 2311's

(2) \$55.00 PER HOUR

360/400 131K

6 TAPES 5 - 2311's

(3) \$65.00 PER HOUR

360/400 131K

7 TAPES

7 and 9 TRACK

800 OR 1600 B.P.I.

2314 (8 MOD)

1400 2314 2310

D-0.5/CS/20 CS40

FOR IMMEDIATE

GUARANTEED

SCHEDULING CALL:

DATANAMICS

624 SOUTH MICHIGAN AVE

CHICAGO, ILLINOIS 60605

(312) 939-1323

24 HOURS PER DAY

total

THE DATA BASE MANAGEMENT SYSTEM

The MIS systems approach of the Seventies



CINCOM SYSTEMS, INC. 2161 Victory Parkway, Cincinnati, Ohio 45206 • (513) 961-4110

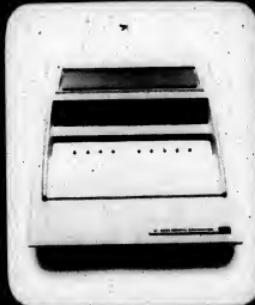
COMPUTERWORLD



1970 MINICOMPUTER SUPPLEMENT

July 29, 1970

Supplement/Page 1



mini

Price is the only thing cheap about the minicomputer.

Proliferating at a fast pace, the small, low-cost, high-speed computer has found its way into more than 10,000 installations to date, with total minicomputer shipments expected to reach \$700 million per year by 1975.

Digital Equipment Corp., with an estimated 60% share of the current market, presently reigns as king of the minicomputer hill. Yet, because the mini has made it possible to computerize many small jobs on an economical basis for the first time, applications have expanded rapidly and a host of new companies, all vying for a piece of the action, have appeared.

Current leaders in the field are Hewlett-Packard, Honeywell's Computer Control Division, and Verien Data Machines, with several young firms like Data General and

Interdata coming on fast.

The biggest reason for the so-called "mini-boom" is cost. Large-scale computer systems may price in the millions, while the typical minicomputer — a parallel, binary processor with 16-bit word length, 4,096 to 32,768 words of magnetic core storage, and 1- to 1.5-msec cycle time — can sell for less than \$5,000.

Minicomputers can perform many functions previously sacred to full-scale computers, but incorporated in complex computer system hierarchies, interface with many kinds of devices, and operate in a time-sharing mode.

In this supplement, Computerworld examines the characteristics, applications, features and drawbacks of the mini, showing why, to the small- and medium-scale user, it is perhaps the cheapest and most effective aspirin for his EDP headaches.

Big Daddy to the Mini?.....Page 2

Minis Mean Business.....Page 6

Product Tests Optimize Mini Use
.....Page 10

Milisystems Through Peripherals
.....Page 12

MSI Aids Modular Assemblies Design
.....Page 15

Began in 1944

Minicomputer's History Traced Back to 'Whirlwind I'

By Don Strong
CW Supplements Editor

Let's not question the minicomputer's papers.

This low-cost, high-speed ma-

chine which is able to perform most functions previously sacred to larger computers, now appears to be of royal blood.

Having raised the eyebrows of

many who considered it the son of several earlier mainframes, the minicomputer's parentage is now clear. One—the EDP family named mini—traces back to a stateside old gentleman named "Whirlwind."

One of the first high-speed stored program computers and a contemporary of such old-timers as Edvac, Seac, and UNIVAC, Whirlwind I only bears the strongest resemblance (apart from size) to the minicomputer, but also pioneered several aspects of present day computer hardware and software, including the invention and development of magnetic core memory.

For example, at the first large-

scale, general purpose, digital computer engineered to operate on real-time problems, it was probably the world's fastest

in its initial version with electrostatic storage, Whirlwind I could perform 20,000 operations/sec. It had a word length of only 16 bits, but the arithmetic unit was implemented in such a way that when memory was expanded to 32 bits, it could contain up to 32 bits simultaneously. It also included a software package that provided for multiple precision and floating point arithmetic.

Analog to Digital

Whirlwind I's history actually began in 1944 when it was originally conceived as the computing element of a universal flight simulator to be developed for the Office of Naval Research. The computing demands of aircraft simulators required a degree of speed, flexibility, and precision which MIT's Servomechanisms Laboratory found unattainable by analog means. Accordingly, they decided to build a digital computer.

With the development of basic components and circuits over the next four years a machine of enormous size evolved, possessing many of the performance traits inherent in today's so-called "desk-top" or minicomputers. This was Whirlwind I.

Whirlwind I initially had electrostatic storage tubes with a capacity of 256 (16x16) words. Its input/output facilities consisted of a Friden Flexowriter plus a photelectric tape reader. Later in its development, Whirlwind I's electrostatic storage was replaced through the first use of magnetic core storage (2048 words), which got only reduced portions of storage reliability than threatening the success of the whole project, but also greatly increased the computer's operating speed.

In the following months a more efficient input/output system was installed and additional I/O devices were provided. These included an auxiliary storage and magnetic drum, with 24,576 word capacity, a buffer storage magnetic drum for handling radar input data, display

oscilloscopes, and digital magnetic tape units.

Impressive Credentials

Other Whirlwind I pioneering achievements included:

- Development of the preventive maintenance technique called "Marginal Checking," a procedure for enhancing reliability by pinpointing deteriorated components before they failed.

- Development of techniques for the numerical control of metal cutting.

- Development of simplified programming techniques through which conversion programs and other general-purpose routines were instituted to aid programmers in debugging programs.

Whirlwind I also provided the first large-scale, real-time control system. From early experiments in tracking aircraft by digital computer, the Cape Cod system was devised, with Whirlwind I as the control element.

The system was a network of radar sites feeding data to the computer, which directed and transmitted vectoring instructions to scrambled fighter interceptors.

These techniques were later incorporated into military air defense, including the SAGE system, for which Whirlwind I and the Cape Cod system were the prototype.

Since as many as 16 manned consoles could interact simultaneously with the central computer, Whirlwind I can be looked upon as a time-sharing forerunner.

In the spring of 1959, MIT's two primary users, the Digital Computer Center and the Lincoln Laboratory, decided to withdraw and split its own replacement as they no longer saw a need for the machine. The Wolf Research and Development Corporation (WRDC) of Bedford, Mass., later indicated, an interest in the computer and leased it from the Navy.

Recently, the Smithsonian Institution in Washington, D.C. acquired title to Whirlwind I and plans to transfer important elements of Whirlwind I hardware and documentation to the national archives.

CONSIDERING A MINI? ASK



COMMAND SYSTEMS CORP.
POB. 500, 800 AVENUE H EAST
ARLINGTON, TEXAS 76011
Telephone (817) 261-4424

To mini computer users we offer

Consulting Services in the following areas:



- * Equipment Selection
- * Systems Design
- * Application Programming

We are maxi-experienced in mini's for commercial, engineering, process control and communications applications.



DYNAMIC ACCESS CORPORATION
220 Park Avenue South
New York, New York 10003

Call Merv Glazerman at (212) 475-1830

New from DATAPRO 70

All About Minicomputers

A comprehensive 26-page survey report, reprinted from the latest monthly supplement to DATAPRO 70, the EDP buyer's bible.

- Detailed comparison charts cover 77 minicomputers from 40 manufacturers.
- Straightforward guidelines help you evaluate minicomputer characteristics and select the best machine for your needs.

**datapro
research
corporation**
12024 WALNUT ST.
PHILA. PA. 19103

YES, please send me _____ copies of
All About Minicomputers.

- Enclosed is my check for \$10.00
per copy.
- Bill my company for \$10.00 per
copy, plus \$1.00 handling charge.

Name _____

Title _____

Company _____

Address _____

City _____ State _____ Zip _____

* Pennsylvania residents please add 6% sales tax.

designer's dream

COMPUTER AUTOMATION'S PLUG-IN INTERFACES SAVE DESIGN TIME AND CUT COSTS

Now you can select from a line of control components that offer an array of peripheral devices and I/O options. By developing a large family of plug-in interfacing devices, Computer Automation has designed a computer interface system with minimum effort, time, and expense.

A few examples include:

- Mini-Disc: Fixed head per track Storage to 250,000 bytes.
- Line Printer: Eighty column, 350 lines per minute or 132 column, 600 lines per minute.
- Autoload ROM: For remote startup of computer including bootstrap loading of memory.
- Magnetic Tape: From 10 ips to 37 1/2 ips, 556 to 800 bpi. 7 or 9 track read/write or read/write/latch or small reels. Multi-deck operation from single adapter.
- Memory Protect: Coupled with the power fail option; this provides the feature of ROM operation during power failure, but enables the ROM portion of the program to be electrically altered by switch control. Up to 8K x 16 of effective ROM core memory is available through this inexpensive approach.
- Communications Adapters: From 300 baud to 4800 baud (9600 if not line limited) adapters for use with most standard modems.
- Communications Multiplexers: For concentrating up to 32 low-speed lines for relay over a single high-speed line.
- General Purpose Modules: A group of modules such as logic modules such as Relay Buffers (in and out), Digital Buffers, Gated Channels, Analog Adapters, Multi-Purpose Modules, with control and interrupt, and buffered gated channels.

The Company's sales operation has been broadened, too, with new offices in Washington, D.C. and London, England.



COMPUTER AUTOMATION INC.
1000 BETHESDA BOUNDARY ROAD, Bethesda, Maryland 20814
TELEPHONE (301) 890-0510 - TWX 510-588-1517

Dwarfing the minicomputer, Whirlwind I nonetheless pioneered several aspects of present-day, small-computer hardware, including the development of magnetic core memory.



How much PDP-11 will you have?

Well, how much do you need? A small, dedicated machine for OEM controlling? A large, multi-user system? Something in between? Or maybe you don't know yet.

Doesn't matter. PDP-11's UNIBUS™ lets you do anything—now or later. First you plug the central processor into the bus, then some memory, then an I/O device. Already you have by far the most powerful mini-computer there is: 400 instructions; 8 general registers; bit, byte, word (16-bits), and multi-word capability; multi-channel DMA; automatic priority interrupts; hardware stacking; re-entrant and relocatable code.

That's the processor. But the UNIBUS is even more interesting, especially in an expanded system. Every device (and that includes memory and the CP) is pluggable, independent, and asynchronous. Devices can communicate directly with devices or with memory. Disk to display, for example. The interfaces are built into the device controls, so when you plug in, you plug in everything. And you can keep plugging in, for a long time. UNIBUS is only a few dollars a foot.

PDP-11/20—memory, TTY, and UNIBUS included—is somewhat more. But you can wear one for only \$10,800. Quantity discounts available. Delivery now.

COMPUTER EQUIPMENT CORPORATION
Maynard, Mass. (617) 897-6111

Managers Speak Out on Minicomputer's Future Role

By Don Strong
CW Supplements Editor

Competing on the role of the minicomputer, a Honeywell spokesman perhaps put it best when he said: "As in the selection of any tool, the user must consider his needs. You don't buy a high pressure/high volume pump to rid your basement of water. Nor do you use a basement pump to bail out the Queen Elizabeth."

To evaluate just how big and what kind of a splash the mini is apt to make in the next few years, the CW staff spoke with a number of men responsible for charting the course of small computers.

Q. Is there a mini revolution?

Loper: Prices for computer hardware have come down in an expected fashion. Consequently, there are large numbers of manufacturers of such hardware in an attempt to capture a share of the market. Yet such a revolution cannot occur in totality until peripheral costs for minis have come down to an equivalent level.

Rawson: Actually, the mini revolution is no more a revolution than the introduction of any new technology. It's a natural because computers have always been available. Now, they are simply being offered in a smaller package.

Hoag: Well, if it isn't a true revolution, it certainly is rapid evolution. Depending on the definition of the minicomputer, 10,000 to 15,000 units have been sold to date, with 1975 expected shipments of 30,000 or more each year.

There are some holdups to the minicomputer's growth however. For example,

shortages of real-time programming personnel, and a need for better understanding of the applications to which these machines can be applied.

Q. Is the mini really a flexible, "can-do" time and money saver?

Kenney: The minicomputer is truly a "can-do" machine; it can only be a tremendous money-saver if the user keeps in mind the objective of minimizing the total costs, consisting of design, system

"The minicomputer can be defined as a general-purpose computer which can perform more than one add per second for every dollar of CPU price."



Donald P. Kenney is program manager of Data Systems and Equipment with the Mobil Oil Corp. He is responsible for directing a program to evaluate, test, and install data systems and equipment at worldwide corporate locations.

development, programming, test installation, scheduling, planning, backup, and maintenance for specific systems.

Loper: The minicomputer is flexible only within a narrow range of definitely mini-oriented applications. It is not fair to say that a minicomputer is anywhere as flexible as a larger, more costly computer system, with such things as time-sharing and on-line Fortran.

Hoag: Time, space, and money can be saved as a function of the application to which it is applied and the way it is used in the application. However, the growth of the minicomputer market seems to indicate users believe the computers are saving money, improving results, or in other ways, pay their way.

Q. Is it an independent mainframe with I/O capability?

Loper: Mini manufacturers vary on the

amount of interface equipment supplied with a mainframe. Most, however do not come with I/O capability attached, but with merely the minimal for a minicomputer. Users must determine the amount of interface capability supplied with each mainframe when doing competitive pricing.

Q. What should a minicomputer cost?

Kenney: \$20,000 should define the upper limit. And, they will cost less than \$3,000 probably before long. However, the mini is not less a computer than the one many of us knew 10 to 15 years ago. Only the price has changed. Maybe we should bring performance into the definition, such as defining the mini as a

"Software will undoubtedly cause the largest problems in the integration of a minicomputer system."



F. Gail Loper is manager of product development with The Foxboro Company. He is responsible for directing systems engineers and programmers who develop the company's digital systems product line.

general-purpose computer which can perform more than one add per second for every dollar of CPU price.

Hoag: I think we sometimes get tangled up in the CPU price. A computer is only useful when it has some I/O and/or peripherals and is programmed to do something. The reduction in CPU price does affect overall system price. However, in many cases the CPU is an insignificant fraction of the installed, programmed total system price.

Rawson: I think it's really within five years we will see mini system costs lower than \$10,000, however there is no question but what a CPU can be purchased for under \$5,000 at least by that time.

Q. Can the mini be programmed by user personnel, or is it an ultra-specialty system?

Loper: Minicomputers very definitely require experienced programmers, unless the application requires only the use of computational capabilities, provided by a compiler-type language.

Rawson: Most user personnel are going to be dealing with existing computer machines. Instead, it's a very useful systems device that will not be organized for utilization by user personnel!

Hoag: I disagree. Most minicomputer systems are programmed by user personnel. The user who is applying it, I know more about his application than I do about the computer manufacturer. Many minis have considerable software to assist the user, such as execs utility routines, peripheral handlers, Fortran IV compilers, etc.

Q. Is it appropriate for time-sharing not all at all?

Loper: Expansion of a minicomputer to be able to handle time-sharing will be part of the life of the minicomputer bracket. It is possible, however, to develop time-sharing type software for mini-computers.

Rawson: The mini is appropriate for anything you can figure out to make it do.

Hoag: The mini is appropriate for small time-sharing systems, process control, laboratory work, communications, for almost any application.

Q. Will minis replace or supplement bigger, more expensive hardware now in sight?

Hoag: Both the mini and the large machines have their place in the large company. The mini will never replace the larger mainframe but rather will complement it. The minis are assured of their place in the laboratory, in manufacturing, and so on.

Loper: In many cases minis will replace large systems in those instances where users have over-bought hardware; thinking that in the future they would need the extra flexibility which this would buy them. Realistic users tend to buy to smaller machines and add more CPU's to their system, rather than add to an

"How much time and money a mini-computer can save is basically a function of its application."



John Hoag is product manager for industrial control systems at Honeywell's Computer Control Division. His responsibilities include planning and coordination of division activities for Honeywell's Series 16 industrial control computer system.

existing larger CPU; in those cases, where expansion eventually becomes unnecessary, the mini is undoubtedly have saved capital expense.

Hoag: Minis will replace some very old control computers and will be put in to provide added functions to existing installations. In at least two cases, we have found it more economical to put a minicomputer system than to expand an older, out-of-production system. Yes, the mini is able to "talk" to the older system.

Rawson: They will certainly make a lot of inroads bigger and more expensive hardware, simply because they are less expensive and are competent enough to do the job.

Q. Can the large company find true happiness with the mini as a free-standing or integrated unit?

Loper: Very definitely, providing the pay-back objectives and technical scopes are kept small and realistic, and the job's scope is not allowed to grow appreciably during the life of the system.

Hoag: There is great potential for minis entering business data into our large systems and for stand-alone systems for some non manning applications.

Hoag: There is no question that the mini will find wide use in the company as well as in a small firm. They may start off as stand-alone systems, but eventually will get tied into larger computer systems that are looking at several related operations.

Q. Is there a trend toward centralization?

Loper: A trend toward centralization of certain functions definitely exists in the computer control industry. Such functions as plantwide optimizations, and production scheduling will be placed in a centralized system, while the minis will be used to handle small high-frequency, low order tasks.

Hoag: This helps the trend towards centralization. In almost any operation, to centralize, cables must be run to bring all real time data to the central location. If one wants to read 100 temperatures for example, 100 pairs of wires must be run to the central location. However, a mini

can stand out near the temperature sensing devices, scan and monitor them, and send pertinent data back to the central location via a few pair of wires.

Q. If the mini can be integrated into existing automated systems, what modifications are necessary, and will the cost of integration be prohibitive?

Hoag: It is a continuing objective to capture the data as close to the source as is economically and operationally feasible. Since the mini will not replace the large computers in the data center it is only this area of data collection where ease of integration is a concern. The flexibility of the mini makes it an asset to integration.

Hoag: The mini can be integrated into existing automated systems, but only if it makes sense to do it. In many cases, the present automation system may be doing a good enough job so that a computer isn't needed.

Rawson: Compatibility with a computer will be a big factor in determining the costs of integration with the present automated system.

Q. Where do the real costs of integration lie — hardware, software, or interface?

Loper: Software will cause the largest problems for integration, along with interface problems in hardware. Consequently, the user must realistically estimate his costs to determine when the minicomputer system really is the cheapest way to go.

Hoag: Installation costs will also run high — depending on the number of cabinets to be run and their length. Another cost may be the study of the process to be controlled. If this is a well-understood process, or has been automated before, the study may be minimal. If it is a new or poorly understood process, study costs must be significant for the entire integration project.

Rawson: The total life-cycle costs of minicomputer systems should always be carefully planned and controlled, in particular, software costs.

"The difficulty with decentralization is that you must have competent people to operate smaller computers or you have to have a well-engineered system."



Edward B. Rawson is vice-president and technical director with Searle Medications, Inc. He is responsible for supervising the development of his company's hardware and software products.

Rawson: The costs would appear to lie even more heavily in the cost of consideration of the fact that he has to expend money in all three areas and not concentrate funds simply in one direction.

Intermediate Language

Intermediate Language (IL), a new software product designed with the minicomputer in mind, now permits programming between Assembly Language and conventional higher-level languages.

Recently developed by Evans Griffiths & Hart, Inc. of Lexington, Mass., IL makes it possible to write assignment and conditional statements in higher-level languages, but with complete control over the code generated utilizing all features of the machine.

'A Computer in Every Home' Possible With Mini T/S

By James D. Bailey

Specialist to Computer-world

If the often made and just as often debunked prediction of a computer terminal in every home is ever to become a reality, it could well be through small computer time-sharing.

The computer-based time-sharing system is perhaps the best example of what the small computer can be made to do when state-of-the-art software technology is applied.

One statistic that invariably is made in a discussion of small computers is that they are good for time-sharing. The reality of a variety of applications for a minicomputer system with 16 terminals, eight different program languages, and such peripherals as paper tape reader and punch, magnetic tape storage, and disk storage, would seem to refute this. On the other hand, the time-shared programs may well refute the statement that these devices are nothing more than adding machines.

Small computer time-sharing actually means three different types of systems. There is the shared programmable calculator; the shared multi-language computer system (supercalculator); and the true multi-purpose system. All owe their availability to the software technology that has evolved for the large computer.

What has tended to slow growth in this area of the computer technology is cost. By definition, small computers are cheap. So are programmable calculators. Anyone offering a small computer-based time-sharing system must offer it at a per terminal cost below the cost of an individual small computer, or below that of the individual programmable calculator, at the small end of the spectrum. Similarly, both systems must have a per terminal price at least competitive with that offered by the time-sharing utility.

The most often quoted per terminal cost for small computer time-sharing is \$5,000. That is to say, the small number of terminals interfaced to a programmable calculator will cost about \$5,000 each. If a single number that can be interfaced to a single language small computer-based system and the even larger number that are available in the multi-purpose minicomputer-based system,

Priced the Same

Since minicomputer time-sharing is priced about the same as the time-sharing utility's terminal, the question is why would anyone want it when they can get that terminal for the same price? The answer is simple. If an application involves pure arithmetic, the shared programmable calculator might do the job better. Here, several persons share a cost that amounts to an electronic slide rule. The disadvantage of this system is that calculators are hard to program, often requiring an extensive knowledge of machine and assembly languages. Also, there is no program sharing and no program storage.

The single-language system or "supercalculator" makes use of far more easily learned languages like Basic or Focal. Not only do these languages allow for number manipulation but also permit the use of letters and words.

Calculation is more efficient because numbers and words are used. Longer programs can also be written, but, the size of the problem to be solved is limited, and there is no on-line program storage. The key advantage is the simple language.

The multi-language, computer-based system leaves the limitations of the calculator and "supercalculator" behind. It permits considerable on-line storage and the execution of long programs. It is often used for the same reasons as the other systems, but on a much larger scale, as well as totally different applications.

These systems take their lead from large

time-sharing systems, providing as much as possible the same capabilities. The major differences are program execution time, the ability to handle very long programs and large amounts of data, and



James D. Bailey is a marketing specialist with the Digital Division of Mini-Comp Systems. He is responsible for sales support and systems consulting for the company's T/S/8 computer-based time-sharing system.

limits on the number of users to about 16. These systems are often purchased to complement an existing batch-processing computer.

Perhaps the device around which the first two systems are built would better

be called a computer than a calculator, and the central device of the minicomputer a logic system for lack of a better term. In the first two systems, the central device, computer, is not the one used. Instead, perhaps we can illustrate this by using education as an example. The calculator and "supercalculator" are more than adequate for teaching mathematics and computer programming. Here, the student must prove he knows algorithms or algebra, so he literally teaches what he knows to the computer.

Applications Will Expand

As more people discover the existence of minicomputer time-sharing, its uses will expand. Primarily, these will be commercial-type applications that need not require a computer and could be done on large systems if the price were lower. Today, it is possible to offer computer time for \$3 to \$4/hr., and future prices will be lowered to \$1 to

\$2/hr.

Because future minicomputer time-sharing system prices will come down, the result will be more intelligent, students enter college with more preparation, large businesses entering the business world, businesses will make much more liberal use of the computer due to systems like these. Many will take the attitude that they cannot afford not to have a computer terminal for every technically-oriented employee. And, the computer will enter the home on a larger scale than ever before.

While the roles of the small and large computer-based, time-sharing systems will continue to differ, the two are more and more merging. Large computers operated by time-sharing utilities in the years ahead may no longer "talk" to terminals at all. Instead, they will be interfaced to minicomputer time-sharing systems.



"Keep your competitive edge"

Now even a small business organization can gain and maintain a competitive advantage through sharper management practices. Mini-Comp's customized management-information systems provide the means! With a Mini-Comp management information system, all department and branch operations can get instant access to the latest, most accurate, most complete information available... in order to make the decisions that you depend on for success in business. Mini-Comp management information systems are so flexible and adaptable they can take almost any form you want them to. Each one of our integrated problem-solvers serves many persons simultaneously, freeing them from tedious detail so that they can do what you really pay them for! A Mini-Comp system is easy to use and speaks your language. That it's a computer is only incidental. For it's not a confused computer computer that takes a technician to run. It is strictly best computer system... only the one that is best for you! So we haven't been too proud to use the other computer company. The result is a tight-money computer that pleases comparison shoppers... and really knows how to cope with competition.

To find out what a Mini-Comp system could do to improve your competitive position, just call ...



mini-comp, inc.
Two Mercer Road, Natick, Ma. 01760
Telephone (617) 235-5015

Business Applications for Minis Will Keep Growing

By Philip C. Davy

Special to Computerworld

The minis are on the move, but what are the implications for users of business data processing?

In the next five years the business applications for minicomputers will be an order of magnitude greater than all others. And there are some very good reasons.

The need for automation in general business and government has caused a demand to turn on the small businessman (\$500,000 to \$10 million). He must often compete with larger firms which have tremendous resources and purchasing power, and are much more efficient because of the extent of their automation.

Turning Tide

The image of the computer monster in the multi-hundred thousand dollar bracket has in the past intimidated small business management, which has had to come to terms by the need for mobility, more service, and the convenience of a nearby location. But the tide is turning.

The torrent of publicity on minicomputers, the proliferation of computer-oriented for management systems, and the marketing techniques of some of the min-makers are beginning to have a profound impact on John Q. Small.

Add to this the fact that he is required to keep elaborate records by force of law, and he performs combined accounting functions for local, state and federal agencies, and it spells motivation with a capital "M."

Then the inventory control dragon is beginning to breathe smoke in his face, as technical advances geometrically spawn new generations of products and services.

Irreversible Trend

Net effect? The word is getting around in small business circles that you have to have a computer.

But with it is coming the realization that the computer may not take up much more space than a typewriter and its stand, and that the cost can be amortized in a few years. This message, and the technical reality behind it, have established a trend which will not, and cannot, be reversed.

Nature of the Beast

The potential users of minicomputers form a broad-based pyramid divided into five levels. The top segment includes large companies, and the bottom represents the smallest firms. At the top is the group which now uses large EDP systems. The next level down uses small EDP systems.

The third segment includes firms which use unit record equipment. On the fourth level are the users of accounting machine systems, both electronic and electromechanical posting and billing equipment.

At the base of the pyramid, comprising the largest proportion of the market, are those firms which are using manual bookkeeping methods, possibly with some assistance from

independent bookkeeping and accounting services.

Any of these levels might use service bureau assistance. But operating with a service bureau can include drawbacks and difficulties:

- Security of data. Few firms are happy about allowing confidential operating information to get out of their hands.

- Changes in procedures. Few outside services tailor their packages to the customer's operating environment. Such customization tends to be all the other way.
- Loss of convenience. Data delivered to the service bureau is not available for reference and analysis while processing is underway. Several days may be required for turnaround.

Time-Sharing

Time-sharing may be able to eliminate some of the problems of using an outside service bureau. However, time-sharing services are not without their own problems.

- Terminal equipment shortcomings. Teletypewriter terminals are not well suited to business data entry and printing operations.

• Communications volume. The sheer mass of business data to be transferred can cause communications costs out of proportion to the services gained.

• Wrong emphasis. Most available time-sharing services are oriented toward scientific and engineering applications.

The implication here is that, with their present orientation, and with existing terminals, the time-sharing services are not going to make mighty inroads on the business data processing scene.

Enter the Minis

It's significant that the mini-computer can fit anywhere for the user. At the top of the pyramid it can function as an intelligent front end, or satellite to a large-scale system.

At the next level it will, if sufficiently modular, be directly compatible with the smaller EDP systems. Continuing down, it can also effectively supplant both unit record and accounting machine systems in their present forms.

Mini and T/S

However, time-sharing services need not regard the minicomputer as an enemy. Some recently announced systems even employ the mini as a remote batch terminal processor. Terminal processors promise to be very effective in reducing data costs by virtue of their buffering, formatting, and editing talents.

The "intelligent" terminal processor itself can time share its facilities and control several interactive terminal devices. Thus these types of minis may open up profound new business opportunities to the time-sharing people, by giving them a terminal which meets a wider range of applications.

On the other hand, the non-computing accounting systems are definitely crossing swords with the minis. The amount of human intervention required when using unit record equip-

COMPUTERWORLD

Business Applications for Minis Will Keep Growing

ment and the electronic accounting machine (EAM) system approach make them highly vulnerable to this mini competition, since the errors in the system are directly proportional to the number of operator functions performed.

If the volume of work increases, a firm has to add another \$8,000 to \$20,000 machine. Each machine only handles so many forms and records simultaneously.

So, if a unit record system is to be added to expand capacity, if there are several different functions to be performed, separate machines may be required. Contrast this with, say, a \$20,000 minicomputer system with a keyboard, 4K of memory, paper tape reader or inexpensive magnetic tape unit, and an interactive form printer. System throughput can be doubled merely by adding a second interactive printer for a fraction of the system cost. With this kind of performance, savings increase proportionally.

Additional user programs can allow multiple stations to be a day, so identical units have to be added to expand capacity. If there are several different functions to be performed, separate machines may be required. Contrast this with, say, a \$20,000 minicomputer system with a keyboard, 4K of memory, paper tape reader or inexpensive magnetic tape unit, and an interactive form printer. System throughput can be doubled merely by adding a second interactive printer for a fraction of the system cost. With this kind of performance, savings increase proportionally.

Additional user programs can allow multiple stations to be

processing a number of separate jobs without interference.

In a system organized around a general-purpose CPU any of the user stations can access the same data base files (e.g., customer and inventory files), or using or building a file in common with other operators.

Unit Record

The same realities impinge upon the unit record systems. A number of hours of intervention is needed to handle the cards, load the machines, and set up new programs. Storage requirements for a very large data base can be expensive. In a nutshell, the cost-performance characteristics of the minicomputer are so much better than either the EAM or unit record systems that, despite the scream of pain which will ensue, they will become obsolete.

Mini Design, Maxi Market

Not all minis are suitable for business DP users. In fact, few are, because they weren't designed with the parameters of the business application in mind.

The first consideration is that accounting, from business to business, is about 80% alike, and 20% different. Every business has its own unique tax laws, these functions differ mainly in the formats, and in the kind and amount of detail involved.

Therefore the minicomputer which will meet the needs of

business, and in particular the price requirements of small business, must employ a sophisticated programming approach which is standardized in the main, but which can be customized on the periphery.

The software must thus be modular in concept, and must be available in "packages" which can be assembled to suit specific tasks.

Beyond this, such features as time-sharing, multiprogramming, and the designation of jointly-accessible files require an addressing scheme in memory which allows the features of large-scale processors. In particular, relative addressing must be implemented in the hardware to allow dynamic program relocation.

Although any general-purpose computer can be programmed for business applications, those that can be completely specified, many conventional minicomputer features and hardware facilities are not especially adapted to the business data processing environment.

Staying Afloat

The minicomputer field has been described as "explosive," and "chaotic." The number of manufacturers in the minicomputer field has grown tremendously in the last two years (now estimated to be around 70).

Fortunately, applications areas have grown just as fast, allowing small firms to get a toe-hold in the market.

Software Opens New Worlds for Minis

By Allan Whitaker

Special to Computerworld

A computer user today recognizes that the performance of hardware is no longer the primary concern; with the computer system will solve his application. Since software is required to instruct the computer, a more important criteria for the success of his computer installation is how efficiently the manufacturer has integrated the software to coordinate the hardware components.

Today, real-time executive software systems are opening a new world for the small computer simply because the users recognize that the application of any computer system requires providing adequate capacity for real-time data acquisition and control (foreground), their system software does not usually provide the resources necessary for data processing activities (background) concurrent with the real-time acquisition and control.

The ability to perform real-time acquisition and control while performing program development on a time-available basis represents a larger sphere of small computer applications.

Computer manufacturers have responded with operating systems that allow background operations to occur concurrently with foreground processing.

In a foreground-background operating environment, the foreground processing occurs when an external event commands the computer, i.e., an interrupt occurs. Background operations occur when there aren't any interrupts requiring processing.

that failure to utilize its full capabilities represents a small loss of return on investment, and, therefore, is not a major concern of its users.

Foreground, Some minicomputers

O. Allan Whitaker is product manager for real-time and hybrid systems at Systems Development Laboratories, Inc. He was instrumental in developing the Real-Time Executive software system.

provide adequate capacity for real-time data acquisition and control (foreground), their system software does not usually provide the resources necessary for data processing activities (background) concurrent with the real-time acquisition and control.

The ability to perform real-time acquisition and control while performing program development on a time-available basis represents a larger sphere of small computer applications.

Computer manufacturers have responded with operating systems that allow background operations to occur concurrently with foreground processing.

Foreground program implementation, therefore, requires hardware.

Additional hardware is required if the data analysis must be separated from the real-time acquisition in order that other real-time acquisitions can proceed without interference. Due to the dynamic nature of real-time foreground processing, interrupt, e.g., enable, disable, arm, disarm and trigger interrupt, appear in the computer instruction repertoire.

Processing of interrupt by a foreground-background operating system is usually achieved via interrupt control software.

When interrupt occurs, a process known as "context switching" occurs. In minimal form, "context switching" overhead involves:

- The recognition of the interrupt by the operating system.
- The CPU operating environment and executive status of the program that was in execution is saved in a pushdown list.
- The program that is to respond to the interrupt is located and placed into execution.

The use of real-time executive software systems with small computers reflects the growing applications of minicomputers who recognise the need to get optimum return from their computer system resources. They also reflect the highly reported trend of users investing more dollars in peripherals and software than in central processing units. Most important, it optimizes computer usage today.

Attention mini computers.

No mini computer has ever enjoyed choosing a printer.

Mainly because there have never been any appropriate printers to choose from.

On the one hand, there were little typewriter-type printers that were much too slow for high-speed mini computers.

And on the other hand, there were big superspeed printers that were designed for big superspeed computers. And they were much too expensive for mini computers.

Those were the choices.

And if the mini computer didn't like it, it was "Sorry, pal, take it or leave it."

Not much fun.

So if you're a mini computer, you'll be glad to know there is now a printer that was designed specifically for you.

It's not too slow. It's not too expensive. It's exactly right.

So rejoice, mini computers.

Rejoice.

Nortec's mini line printer.

Nortec 200 is 132 columns, prints at 200 lines per minute, produces crisp type on up to 6 copies. The entire unit, with all electronics including buffer controller, easily interfaced with any computer, is as low as \$6000 in large OEM quantities. It's just a little larger than an electric typewriter. The \$6000 price includes the standard features: IBM-compatible vertical format unit, front-opening yoke assembly for easier form loading and ribbon changing, self-test feature for testing electronics and mechanism. Nortec Computer Devices Inc., a C-T Company, Southboro, Massachusetts 01772, 517-461-2500.

Mini Systems Increase Quality of Processing Plants

By Gerald E. Mahoney

Special to Computerworld

To meet the ever increasing requirements for better product quality, economical plant operation, and increased production, processing plants are being equipped with a greater amount of instrumentation and a high degree of sophisticated control devices.

Small in comparison to more widely popular mainframe computers, the process control computer systems have been in existence for only a dozen or so years. Yet, they have acquired a degree of sophistication that is not only astounding in view of their apparently small size of 100 cubic feet, but important in their rapid deployment by processing industries.

Process control computer systems sample tens, hundreds, or even thousands of process measurements in seconds—temperature, flow, liquid level, and chemical composition. Discrete inputs, representing the on/off status of hundreds of valves, pumps, or other pieces of equipment are also sensed. Data is monitored to determine if they are within preselected limits. If not, special action is taken, either in the form of alarm displays or corrective control action, or both.

Control Functions

Control functions range from relatively simple corrections proportional to the difference between measurement and a reference value (called set point) to complicated, multivariable control laws based on mathematical models of the process.

Control functions are often arranged in hierarchies, with the simplest and most frequently executed operations at the lowest level, and increasing in complexity on succeeding levels. The uppermost level can, for example, deal with overall throughput of a plant on an optimum basis with respect to value of products.

Changes in control parameters can be directed downward. Control outputs from the process control computer system can be set-point changes issued to analog controllers, or the functions of the analog controller could be performed by the computer system which would send valve position commands. The latter mode of operation is known as direct digital control (DDC).

In order to provide plant operating personnel with information on process conditions, and to permit intervention by process operators, extensive man/machine communications facilities are required by the process control computer system.

In addition to conventional computer peripherals, special display panels and keyboards are provided to allow callup and presentation of data and parameters as well as foolproof entry of set points, laboratory data, equipment status information, and many other parameters.

In addition to control functions and related process operator communications, a primary function of process control computer systems is to provide information to plant supervisory per-

Gerald E. Mahoney is a marketing product planner with The Honeywell Co., a division of the company. His background includes college courses in product planning and design systems analysis for a variety of scientific and real-time computer systems.

sonnel and process engineers. Process performance evaluation, production reports, and consumption of materials and utilities are computed and reported.

New control strategies may be tried and evaluation data may be

gathered and logged. Maintenance of process equipment may also be scheduled with the aid of the computer system.

Process Control Software

Standard software support for process control computer systems consists of an extensive library of programs. A real-time operating system is the heart of the software. Such an operating system provides a multiprogramming environment with foreground and background modes of operation. The read-time services furnished by the operating

system include the handling of interrupts generated by contention process inputs and output devices, and a timer program scheduling on a time or event basis, and core and bulk memory management.

Since process control computer systems are intended to operate 24 hours a day seven days a week, additions or modifications to operating programs must be made on-line, and without interference to the process control functions.

Therefore, program preparation and checkout facilities are

offered as background operations on a time shared basis with real-time programs operating in the foreground.

The program preparation facilities include an assembler, a Fortran compiler (which also handles specific statements to permit access to process data), applications programs written in Fortran, source program editors, linking loaders, and subroutine libraries and utilities.

Finally, application software includes applications programs to support the data acquisition, control functions, and operator communications tasks.



Microprogramming Offers More Functional Capability

By Charles L. Methis
Special to Computerworld

Microprogramming is today's buzz word of the computer industry, and like many buzz words, there isn't unanimous agreement on the term. The management within the large companies is frequently confused over microprogramming and its relationship to the conventional, sequential logic design and the conventional programming techniques.

Microprogramming provides a tool that falls between the two extremes of implementing complex functions using integrated circuits, which is the most expensive approach, and high-level languages, which are the lowest cost, lowest performance approach.

Definition

The term microprogramming, as used in this article, refers to vertical microprogramming. This technique involves microinstructions which perform one arithmetic or control function for each instruction executed, the type of microprogramming used

by most small processors, such as PDP-8, SuperNova, and Hetra's computer series.

The distinction between As-

Charles L. Methis is manager of systems development for Hetra. He is responsible for technical guidance and direction of mainframe, systems, and peripheral interface design:

sembly language programming and vertical microprogramming is difficult to specify (the hardware is more complex for As-

sembler Language instructions).

One distinction that is common is that the vertical type microinstructions are generally fixed-length instructions, which are 16 or less bits in length. This fits the IBM 360/25 microinstructions as well as many other machines.

The microinstructions generally have faster execution times than Assembly Language instructions. Frequently, a 10-to-1 performance improvement can be achieved over an Assembly Language program when the function is microprogrammed on the

same machine.

Conventional, sequential logic design is generally implemented using counters to decode control gates. These counters are controlled by the processor to provide sequencing through a series of logical steps. This technique is generally used to implement the hardware in most computer systems.

The significance of microprogramming is that its use in a computer system greatly reduces the system's conventional, sequential logic complexity and cost. (Many microprogrammed processors can do the basic functions provided by the IBM 360/25, at a fraction of the cost.)

Performance is Important

The first factor to weigh when considering whether to implement a logical function using conventional hardware design techniques or microprogramming is performance. Speed of execution is the most important factor, and cost is considered secondary, then the use of conventional, sequential logic design techniques to implement the function is appropriate.

Many cases exist where the cost of unusual performance of a function cannot be justified because the customer is not willing to pay the cost, or the system has other bottlenecks which justify using an approach that costs less at a lower performance level.

The next item of interest in evaluating the use of microprogramming is changeability. Generally speaking, the modification or addition of functions to a machine using conventional hardware design techniques is very difficult, time-consuming, and expensive.

Microprogramming machines, on the other hand, can have changes or additions of new functions quite easily. The design of the change is a little more tedious than conventional Assembler Language coding.

Another item to be considered in the comparison of sequential hardware logic design to microprogramming is that of complexity. If the function to be implemented is complex enough, it is very difficult to implement such a function using conventional, sequential logic design techniques because of timing considerations, logical combinations, and the design combination involved.

Microprogramming, on the other hand, presents an implementation technique that reduces in magnitude the above problems.

In many cases, the design can be done by a specialist who is not familiar with the intimate details of the computer's hardware, and in the case of Hetra's microinstructions, he has no timing problems to consider other than the over all system performance.

The last item is machine cost. Initial implementation cost is not a problem if the thousands of units are to be manufactured. When there are only a few units to be built for special purpose applications, then the microprogrammed machine will generally provide a less expensive product.

When thousands of units are to be manufactured, the product cost becomes a key item.

Now there's a better way. Our new DOS brings batch processing costs down to \$765 a month.

If you've been hanging on to old-fashioned ways because you thought a computer was too expensive, think again. Our new Disc Operating System brings the cost of computation and general purpose processing right down to where your budget lives.

With our new DOS, you'll easily create, check out and run your own programs. Use it for scientific calculations, business-accounting functions, information retrieval, inventory control, school administration — in fact, problem-solving of all kinds.

Anyone who can poke a typewriter key or pencil-mark a card can use our DOS. Because the assembly (or compilation), loading and execution of your programs are under the control of a teletypewriter keyboard or batch input device.

On the other hand, if you're already batch processing with another system, give this a thought. Our DOS can probably do everything you're doing now — for about half the cost.

Because both the software and the hardware are fully modular, our DOS accommodates the needs of many different applications. Lets you vary the number of input/output devices. Add more core memory. Use a card reader as well as teletypewriter. Add a line printer, paper tape punch, photo reader and magnetic tape. Other advantages include software protection and program segmentation. Plus automatic program retention so your programs can be easily reused.

Our basic DOS includes an 8K computer with direct memory access, a 2.4 million-character disc, one teletypewriter and one high-speed paper tape reader. Price is just \$33,600. Or \$765 per month on a five-year lease. And it's upward expandable for your future needs.

Get the full story by calling your local HP computer specialist. Or write Hewlett-Packard, Palo Alto, California 94304; Europe: 1217 Meyrin-Geneva, Switzerland.

HEWLETT  **PACKARD**
DIGITAL COMPUTERS

Manufacturer Product Tests Give Minis Optimum Use

By Armando E. Cuesta
Special to Computerworld

From car transmissions to heart pacers and electronic modules is the wide range of products being tested today by manufacturers in the manufacturing field for real-time quality control certification. The testing of hundreds of different products on production lines represents probably the fastest growing area of real-time minicomputer applications.

This extended scope is possible due to the variety of system oriented configurations supported by many computer suppliers.

Hardware is, however, only half of the story. The implementation of such systems requires the availability of a programming system capable of supporting disk or tape based systems. General purpose real time executives have satisfied this requirement providing a solid foundation for the user to build upon his

specific application.

The manufacturing test field has grown at a rate exceeding any other field of process applications.

The speed and reliability of today's computers make possible the sharing of a

single computer among a number of production lines. Multiple test stands share a single computer attaining a combined throughput very close to the maximum throughput of the individual test stands.

This is possible because mechanical handles and instruments have response and

settling times so high compared to the computer that overlapping of test operations provide optimum computer utilization. A large memory is also a common data bank which can be utilized as feedback information to production lines when a failure trend is detected by the test system.

Some of the spare time can be utilized to run batch jobs such as Fortran computations, assemblies or scientific programs. Present 'real time executives' are designed to support such operations.

An electronics company in the Midwest is utilizing a mini system to test 100% of its electronic modules in seconds and to generate diagnostic data. The accumulated test data is stored in disk and retrieved periodically by data analysis programs which detect production trends and generate management and engineering reports on the status of the produc-

The system is also used by engineering personnel to design new electronic modules and to simulate their operation before the modules are built.

Terminal Minicomputers Bring 'Large Computers' into Offices

By Theo L. Fox

Special to Computerworld
Minicomputers with communications

capabilities may very well be the most significant contribution to the continued health and growth of small-and medium-size business.

Although they may vary in size and capability, these minis can bring the power and speed of a large computer into any office or plant at a reasonable cost. The small business user can then enjoy the same sophisticated data processing systems used by giant corporations through communicating directly with a large central computer system.

From Basic to Computer

Two classes of terminals exist today. Most common is the less expensive and less featured basic terminal, used simply



Theo L. Fox is president of Victor Computer Corp., Belmont, Mass. Prior to joining Victor in 1951, he held various executive positions for several business machine manufacturers.

FOR
MINIS

MACROS

FOR
MINIS

MACROBIT is a real, bona fide, operating, trustworthy, loyal, and obedient assembler designed specifically for minicomputers. And it's complete in 8K bytes with macros, relocation, floating point, common, one, two or three pass operation, conditional code generation, symbolic interprogram linkage, loader and all those good things.

Hard to believe? Look.

General Automation SPC16
General Automation 18/30

IEC 1010

XDS 92

Intertel 3

IBM 360

MAC 16

DataMate 16

Sigma 2/3

PDP 7/9/11

Bailey 855

Tempo 1

Programmatics is that minicomputer software company.
FORTRAN. Sorts. Flow charting. What have you.

Programmatics would like to do it for you. In a small way.
We have a complete explanation of the MACROBIT system.

If you want it, all you have to do is ask.



PROGRAMMATICS
INCORPORATED

a subsidiary of Applied Data Research, Inc.
11661 San Vicente Blvd., Los Angeles, Calif. 90049 / 213/626-6503

as an input/output device to a computer. But the most important, full-fledged terminal is a minicomputer, used to prepare data before and after transmitting.

The basic terminal is equipped only with transmit and/or receive capabilities, usually a keyboard and a variety of input/output peripheral devices.

Usually, elaborate software is required for the central computer because the terminals require a specific discipline, a specific baud rate, and rigid message formats. Unfortunately, it has a tendency to drop information.

In early telecommunications, the user had no choice but to accept the basic terminal if he required an on-line system.

Today, the terminal computer has altered the entire data communications field. It contains the same options as the basic terminal, with many of its disadvantages. Although all these problems have not been solved, this mini means the user is no longer required to build his system around a rigid device.

The terminal minicomputer can communicate with larger computers or other terminals and prepare messages, necessary calculations, editing, and formatting.

Through program control, it can also assist the operator in message development, performing such functions as check digit verification, price and number assignment, quantity-price calculations, and many other arithmetic or algebraic manipulations.

Plus, it can handle page formatting on a hard-copy device or CRT, as well as message formatting such as zero or blank suppression, field alignment, manipulation, and verification.

The result of this expanded capability of the terminal computer is reduced processing time required at the central computer, less programming of the central computer, and a reduction in line charges.

A message to systems designers interested in a higher return on investment in business oriented applications.

Have you tried to design a low cost business oriented system with a scientific computer? Nearly impossible, isn't it. You have to use a large amount of core for all those subroutines. And you become completely frustrated with the complexities of overall format changes. Disappointing development, production and maintenance costs compound the problem.

ATRON offers a better tool for the job — the 501 Datamanager. A mini priced computer specifically architected for business oriented applications. Its use can mean the lowest system cost for you and lowest cost of ownership for your customers.

The KEY is in the architecture ... truly "compiler-level hardware" ... a practical blend of hardware and software.

The architecture of the Datamanager

Concurrent Operation for inputting and outputting data under hardware control, with... execution of high level, variable address, Macro instructions, which manipulate... Variable Length units of DATA, which are defined by...

Data Descriptors in memory.

An extensive I/O capability is provided to handle large volumes of character strings. Separation of

Data from Data Description eases programming changes (particularly data formats). It's truly... "compiler-level hardware" ... including decimal arithmetic.

Your programming advantage

ATRON provides an assembler operating on IBM 360 DOS or on a 501 Datamanager configuration. The assembler, in combination with the 501 "compiler-level hardware", provides the programmer with a high level language capability.

Your cost of program development, modification and maintenance is minimized, because the memory required per function is very low. Compare it! You'll find it keeps hardware costs down.

Your peripheral advantage

The 501 Datamanager peripheral availability includes:

- low, medium and high speed Printers
- low, medium and high speed Communications half or full duplex synchronous or asynchronous

- magnetic Tape
- Disc
- low, medium and high speed card Readers
- TTY or CRT

Multiplexing of multiple input/output stations such as Selectric, TTY, CRT, etc. are also accommodated.

If your design includes special devices for dedicated systems such as OCR, cassette systems, or microfilm type applications, you will find the 501 a particularly versatile element for your system package.

Your availability advantage

The Datamanager is available and being delivered now. We can accommodate your selection of memory and I/O capacity, available interfaces and/or communications, with or without cabinetry and console.

We design for reliability. And we can substantiate the results.

We provide special device interface engineering or assist you as needed to do your own.

If you are looking for a higher return on your investment, call us. We'll see that you get complete details about Atron and our products.



THE ATRON DATAMANAGER
It minds your own business

ATRON

ATRON CORPORATION 1601 Three River Rd., Ft. Lee, New Jersey 07024 • (201) 464-4455

Minis to Score Big Improvements With Peripherals

By Don Strong
CW Supplements Editor

Like a veteran, 5-ft., 7-in. relief pitcher up on wavers, today's minicomputer is small only in size and price.

As the journeyman reliever improves his effectiveness by simply adding a new pitch or two to his repertoire, so can the minicomputer, through the use of peripherals, add new evolution to its controller to a small but dedicated system able to take over the tasks previously relegated to batch processing on a large system or to time-sharing devices.

The fact that minisystems are feasible now indicates some rather big innings to come for terminals and related items.

According to Roger E. Bremer, president of Data Trends, Inc., "The dollar volume of shipments in this EDP area is growing at a rate of nearly 20% annually. "Studies of EDP equipment outside of heavy hardware and mainframes indicate

that shipments by U.S. companies in 1972 will amount to \$7.7 billion, out of an industry total of \$12.5 billion, exclusive of software and services."

Minisystem Is Key

Bremer predicts that because the mini-computer with peripheral equipment designed to maximize its potential continues to open new and broader avenues, in two or three years it will have brought EDP into the day-to-day service of thousands of customers who until now have had no computer at all. "What we're talking about is a minisystem," he feels, "a minisystem, built around a minicomputer using terminals, printers, etc. Bremer also sees the most successful minicomputer application as that which is tailored to meet a specific need.

"The tools are at hand for perfecting and marketing minisystems for thousands of medium and smaller businesses," he

said. "Lower cost components, and disk memories, for instance, can make this a reality overnight. The managerial skills of systems design companies will determine whether the market is realized, and how soon."

Echoes

Thomas J. Reilly, president of Peripheral Data Machines, Inc. feels the same way. He points out that as soon as the minisystems designer develops his concepts, he is launched onto a quest for peripheral devices.

"For auxiliary storage, faster input and output, and data portability in a form compatible with larger data processing systems he turns to magnetic tape," Reilly said. "For random access to large files he seeks drums or disks. For convenient communication in interactive systems he wants keyboard-displays. For rapid output of hard copy he looks for line printers."

These peripherals have been available, Reilly stated, but their price usually matched the computer price. "It doesn't make much sense to put a \$50,000 magnetic tape drive on a \$10,000 computer," he argued.

Applications which appeared feasible when the inexpensive minicomputer came on the scene lost their attraction when high-priced peripherals were required.

The emergence of peripherals, however, aligned in capability and price to the minicomputer, has made it possible for the small-business man to have his own data processing installation for his payroll, inventory control, and accounts payable and receivable.

Mismatch of Needs

While the minisystem negotiates much of the need to utilize service bureaus or time-sharing services, Reilly carefully points out, "this does not imply that the day of the large, powerful computer system is over."

"There are many tasks," he said, "requiring such power, at least, are mainly economical on such systems. "In these situations, however, we often face a mismatch of mainframe and peripheral speeds."

Reilly said both minisystems applications - the stand-alone, dedicated data processing facility and the large system adjustment become feasible when low priced minicomputers are married to low priced peripherals.

Concerned with the limited awareness by users of the extent of cost reduction taking place recently, Reilly offered a few examples: "Today, \$11,000 will buy a 600-line/min., 132-column printer, with all electronics, ready to plug into a minicomputer; or a half-million-bit-track, 800-line/min., 25-in./sec. magnetic tape drive, with full built-in controller, also ready to plug into a mini. A half-million bit, fixed, head-per-track disk, with controller, is available at \$6,200."

With peripheral prices at these levels and still going down, Reilly concluded, "It is not surprising to witness operating or embryonic minicomputer systems for credit-card verification, data concentration, off-line printing, in-house accounting, and computer-aided design."

Rolm President Predicts Mini Will Get Tougher

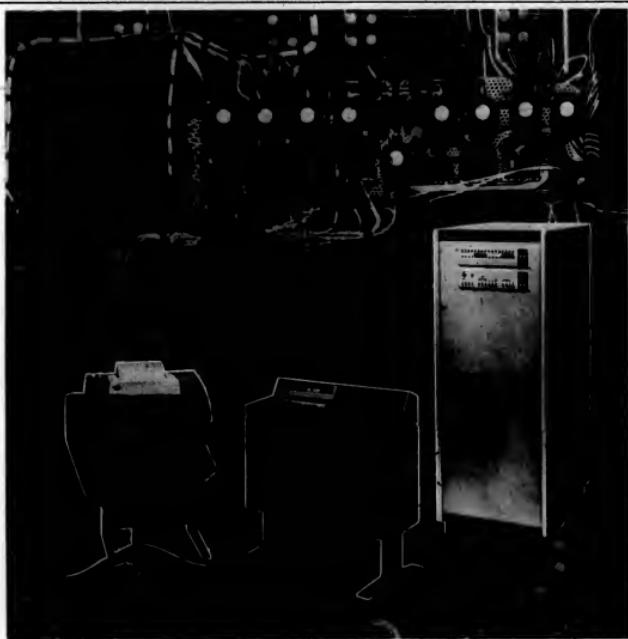
By Don Strong
CW Supplements Editor

The head of a corporation that bills itself as the innovator of the "world's toughest minicomputer" foresees an increasing emphasis on rugged computers that can leave the office and laboratory environment.

Dr. M. Kenneth Oshman, president of the Rolm Corp. of Cupertino, Calif., said, "We're in any kind of combat with the '70s," with the removal of the machine from the lab and taking it to the source of the problem.

"Machine speeds will have lesser emphasis and the big demand will be for more versatile, modular computers adaptable to a wide variety of applications. Computer systems will be required to stay away from offices and labs." The Rolm Model 1601 combines the architecture of a Data General Nova in a package to meet the environmental requirements of airborne, shipboard, and ground electronic equipment.

"I think the growth of minicomputers seems to be a favorite pastime in company boardrooms these days. But, one thing is quite clear. Minicomputers are or can be well suited to withstand the rigors of hostile environments."



25 HARDWARE REGISTERS SAVE TIME ON SMALL TALK

Tempo's standard hardware priority interrupt system responds in 2.5 microseconds. Coupled with a 325 nanosecond access time, Tempo delivers speed that really means something. But that's not all. For a basic price of \$15,800, you get a real hardware interrupt system of more than 800 nanoseconds cycle time, 14 hardware registers (eight general purpose), register to register operation, hand-shaking, I/O, 4 hardware priority interrupts, 14 addressable modules, more than 100 hardware instructions, complete software packages including USA

Standard Fortran IV and macro assembler, plus an ASR 33 line type. Tempo I is available in a half-rack profile or a 60" high rack with room for over 12 peripheral controllers.

Now, let's talk about expansion options: 16-bit floating point, 16-bit integer, 64K parity, multiple/divide, power fail/restart, program load, up to 25 hardware registers, multi-program feature, instruction trap, program flags, high rate I/O, additional memory, and more. Then there is a whole range of peripherals to choose from. And, if that isn't enough,

we can talk about our multi-processor configuration.

Add it all up, and we think Tempo offers more than some of the 14 mega-buck friends.

Drop us a line for more information, or call for nanosecond response.

TEMPO
Computers • Data Communications Equipment

Just a second.

If you're spending over 4K monthly on time sharing, you can afford this second computer.

Get in-house installation of the CCS 2100 for more dedicated inquiry.

Here's what's in it for you:



A Second System—The CCS 2100 means that you can have real-time computing without slowing down the processing on your main computer system.

Fixed Costs—The CCS 2100 Time Sharing System provides for better cost control than outside service costs which are usually uncontrollable.

Better Performance—The CCS 2100 Time Sharing System will handle up to 16 terminals simultaneously with up to 60 million bytes of on-line data storage. Conversational time sharing, dedicated inquiry or real time business data processing can all be handled well by this efficient system.

Lower Cost—The CCS 2100 costs less to lease or buy out-right than to upgrade your present business computer for communications processing. Unattended operation means no extra operators or maintenance staff. The CCS 2100 runs by itself.

Powerful Library and Software—The CCS 2100 is available with a library of programs, and the powerful Extended BASIC Language. Business packages for inventory reporting, budgeting and cost control are all part of the software package.

Isn't it time you had second thoughts?

BOSTON
235 W. Vernon Street
Waltham
Massachusetts
02154
617-897-0210

TORONTO, CANADA
48 Yonge Street
Toronto, Ontario
416-366-7643

LONDON, ENGLAND
Northgate House
North Circular Road
London N.W. 10,
England



Expect more from
CONSOLIDATED COMPUTER
makers of the famous Key-Edit

Chicago Cleveland Detroit Los Angeles New York Philadelphia San Francisco Washington, D.C. Ottawa Montreal

SAVE 30% LEASING 360 SYSTEMS

MODELS [75-67-65-50-40-30-20] AVAIL

LONG OR SHORT TERM - LOWEST RATES

Peripheral Equipment Separately Available

2314-1 2311 2401 2415

Contact: B. Gest
**Computer Marketing
 Associates Inc.**

20 Parkview Rd., Cheltenham, Penna. 19012

Tel: [215] 635-6112

We purchase 360 equipment

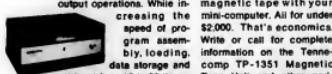
- * Data Processing Systems
- * Time Sharing Systems
- * Computer Software
- * Hardware Interface Equipment

Specialized services to the mini-computer manufacturer desiring to expand the capabilities of his products.



Which would you rather have?
Fast drop in loading ... or 15 minutes of agony?

Economics requires efficiency at low cost. Take a look at the Tennecomp TP-1351 magnetic tape unit and matching interface in action. It's designed to eliminate almost all paper tape input/output operations. While increasing the speed of processing, it's also reliable, loading, date storage and retrieval from 10 to 20 times. TP-1351 stores up to 256,000 words on a 4-track continuous loop cartridge that eliminates handling problems common to paper tape. That's efficiency. For the low price of a TP-1351 you can't afford not to use magnetic tape with your peripheral computer for under \$2,000. That's economics. Write or call for complete information on the Tennecomp TP-1351 Magnetic Tape Unit and other peripheral computer products.



795 Oak Ridge Turnpike • Oak Ridge, Tennessee 37820 • Telephone 615-482-3461

TENNECOMP SYSTEMS INC.

Mini's Educationally Oriented Software Helps Schools to Expand EDP Facilities

By Edward R. McCracken
 Special to Computerworld

Minicomputers are rapidly changing educational institutions from "computer-poor" to "computer-rich" schools.

Now, due to the advent of educationally oriented minicomputers, vocational colleges, junior colleges, and secondary schools, which previously lacked a computer or had a system dedicated to administrative use only, have expanded their computer facilities for instruction. However, further development is still needed before minicomputers become commonplace in schools. These include curriculum materials such as computer-assisted instruction programs, text books, and other support materials that will actually integrate computer methods into the curriculum.

Categories

Computer use in education can be classified into five major categories:

- Computer-Science Education - The study of computer hardware, languages and operating systems.
- Computer Problem Solving - Computer solves problems and develops a procedural understanding of a problem solution.
- Computer-Assisted Instruction (CAI) - Computer interacts with and teaches students concepts.
- Administrative Data Processing - Computer meets information-system requirements of the school.

• Computer-Assisted Laboratory Analysis - Computer controls and/or analyzes results of laboratory experiments.

Until user-oriented operating systems and languages were developed, minicomputers were mainly used in the laboratory where the data-reduction advantages outweighed the disadvantages of assembler-language programming and the handling of paper tape for multipass compilation.

The development of the Basic language at Dartmouth and its subsequent implementation on minicomputers was the first breakthrough for student-oriented systems. Other factors have been the development of small

Edward R. McCracken is education director at Hewlett-Packard's Fortuna Division. He was previously manager of the HP 2150A computer.

• Computer-Assisted Laboratories - Computer controls and/or analyzes results of laboratory experiments.

Until user-oriented operating systems and languages were developed, minicomputers were mainly used in the laboratory where the data-reduction advantages outweighed the disadvantages of assembler-language programming and the handling of paper tape for multipass compilation.

The development of the Basic language at Dartmouth and its subsequent implementation on minicomputers was the first breakthrough for student-oriented systems. Other factors have been the development of small

time-sharing systems and operating systems which allow students to program on mark sense cards. These improvements made computer use easier and increased the number of students using a minicomputer during classroom hours.

Today three major types of minicomputer-based systems for instruction exist; small dedicated time-sharing systems; small batch systems using an optical mark reader (with or without disk); and terminals connected to a minicomputer time-sharing system at another school or a service bureau.

To date, well over 1,000 minicomputer systems have found their way into educational institutions. At least 300 more schools, utilizing terminals connected to mini-time-shared systems, Typical examples of computer-student usage are:

■ Gavilan College, Gilroy, Calif. - A small \$20,000 optical-mark-reader batch system is being used exclusively in Basic language. The system is used in more than 10 courses in mathematics, statistics, and the physical sciences.

■ Phoenix (Arizona) Union School District - Secondary students in ten schools use terminals linked to a \$100,000 time-shared system running Basic.

'Dial-A-Drill' Scores Big With Students

By Don Strong
 Supplemental Editor

Right now a number of New York kids wouldn't give a New York crayon or a Ron Klemko bubblegum card when asked the "Dial-A-Drill" computer task. They're too busy mastering math fundamentals via this unique method of computer-assisted instruction.

Really nothing more than a central minicomputer, perhaps a monitor terminal, a keyboard, a tape-dispatcher, simultaneous, individualized, drill and practice lessons over the telephone to as many as 16 students [CW, June 31].

To the New York City Board of Education the program represents an efficient way of eliminating the need for teachers after-class hours. It assigns problems to each student that will be

neither too easy nor too hard for him, but, at the right level to challenge and motivate him.

Yet, ask the youngsters themselves about Dial-A-Drill, what they say is colorful and mixed as a fistful of marbles.

To fifth-grade student Steven Gilliam, Dial-A-Drill lessons often come at awkward times, like when I just got out of the shower or when I'm eating dinner."

A Second Chance

To young Kelly Jefferson, who hopes Dial-A-Drill is "really a

machine," the program is "just great. It gives us a second chance when we get a wrong answer."

Kelly's sister, Caroline, also appreciates the program, but thinks the computer "sounds funny," an opinion shared by other children.

Rosemary Baez, for example, wonders how the computer's voice "got so strange, I suppose, though it is an artificial voice," she reasons.

Jennifer Chan, on the other hand, is sure the computer sounds like a man, but more like a robot when it talks."



"The computer sounds like a man, but more like a robot when it talks."

**BRIDGE
 COMPUTER
 SYSTEMS, INC.**

Turnkey Systems

Special Interfaces

Software

DATAFACE, INC.

12 Wheeler Road

Lexington, Mass. 02173

617/863-6668

60 East 42nd Street, New York, N.Y. 10017

555 East Boston Post Road, Mamaroneck, N.Y. 10543 - 914-966-7789

MSI Is Helping in the Design of Modular Assemblies

By Nicholas J. Mazzarese

President of Computerworx
Perhaps the most important innovation in small computer technology recently is the arrival of true modularity.

True modularity, as discussed here, is the ability to add or remove whole sections of a computer's elements (e.g., memory, peripherals, etc.) without physically plugging them in or removing them in a "Tinkertoy" fashion. However, when discussing modularity in detail, it is necessary to make a point concerning new techniques. New components techniques such as medium scale integration (MSI) are not ends in themselves, but only can be justified as they produce real benefits to the user.

Using the PDP-11 and PDP-11 respectively as examples, one uses MSI rather exclusively, while the other uses very little way. In small machines, MSI is only used where it is beneficial. Yet because MSI is one of the current buzz words, it is often thought that the most current "state of the art" applications would absolutely require a manufacturer of small computers to use MSI exclusively.

Helps Design and Assembles

MSI is here, however, and where applicable, it is helping in the design of modular computer assemblies. Any switch to more competent techniques, such as MSI, LSI, etc., will take place slowly and as economies dictate. Modularity is perhaps the most important recent technology in small computers. This in turn has been made possible

through the development of new types of computer architecture.

Previously, special purpose computers (such as those used in aerospace applications) had a monopoly on the type of bus structure that made true modularity possible, but it is only recently that this same design philosophy has been incorporated into general-purpose commercial computers.

The new bus techniques allow what is essentially the parallel stringing of computer subsystems. By devising the computer architecture this way, the addition of more computer subsystem units or the substitution of new units for older ones (or damage ones) can be performed with virtually no modification of the original small computer, and with little down time. This in

turn implies a certain amount of "obsolescence proofing" of any computer that uses this sort of bus.



Nicholas J. Mazzarese, president, small computer products division, Dial-A-Drill. Equipped with opportunity did design work on special and unique high speed computers for Sylvania.

Memory Mixing

Such a structure even permits a certain amount of mixing. Some computers may have this sort of bus structure can have different types of memory - both ROM and memory write - in the same machine.

By utilizing a ROM section in

the overall memory structure, it is possible for a user to replace a portion of his computer's main memory with a fixed, rather than an erasable, segment. This can be very advantageous in both macroprogramming and microprogramming, and in that sense it could form the basis of a protected memory that nonetheless retains read-write advantages.

Significant Advances

There are many interesting theoretical reasons that other forms of memory should replace ferrite memories, but the industry has not yet found another form of computer memory as reliable and inexpensive as the current ferrite core memories.

A significant advance will take place when a large high-speed

semiconductor memory is developed, but this is not anticipated immediately.

Other potential memory systems such as the "magnetic bubble" technique, are undergoing research, but at present they are too new, and the research is far removed from practical computer memory applications.

Another significant advance

has been in the area of software. Small computer programming techniques have matured remarkably in what has been, historically, a short time.

Finally, one of the most encouraging trends in the small computer field is that with each technological advance there has been an increasingly favorable price/performance ratio for small computers.

The first integrated real time product distribution information system for under \$2400*

a month

Bisi's custom tailored Product Distribution System includes: Order entry

- Sales statistics • Inventory control • Billing • Accounts receivable • Financial control
- Everything you need in a functionally modular system with a 120 day delivery turn key. Systemize and economize today — call or write:

Business Information Systems
440 Totten Pond Road
Waltham, MA 02154
(617) 891-8426

Specialists in cost effective systemizing of business information



*Based on 5-year full payout lease

'Dial-A-Drill' Big With Students

(Continued from Page S/14)

again, "move like a robot when it talks," says John Henry. Henry puts it another way: "The computer is a man with a deep voice that talks very slow and sounds like static."

While reactions may differ about its "voice," they agree on certain electronic quirks. According to Julian Morris of P.S. 171, "The computer sometimes calls up in a teasing mood."

"The only trouble I get with the Dial-A-Drill," she says, "is that when the computer gives me an example, when I give the answer, it says it's wrong. He says, 'What's the answer?' When I do press the button that says nine, it says, 'wrong, the answer is nine.' It has happened two times already. I am happy that I have the Dial-A-Drill."

Weird Noises

Steve Cohen, of 35 East 85th St., has been using Dial-A-Drill for two years and is also happy with it. He says, however, "There are some funny times. Several times I press my number (ID number) when the computer says to and it makes weird noises or keeps on saying press my number again."

Nine-year-old Elizabeth Rivera offers the best testimonial. "I like the Dial-A-Drill because it helps my sister and I in math. I get excellent in math because I'm in Dial-A-Drill."

**In our next issue,
we're opening a new page in our life.**

computer industry

Computerworld will carry a new section called "Computer Industry," making us the first publication to carry all the news of interest to personnel engaged in the design, production, application analysis, programming and use of computer systems, and in the industry that supports these activities.

Computerworld now truly serves the full computer community.

We will continue to cover all the news of interest to users of data processing equipment. Our coverage in this area has already made us the fastest growing and most widely read user publication — all in just three short years.

The industry is growing. And with it a need for a new media concept.

The computer industry is now the fastest growing in America, and even sharper growth curves are being charted in Europe and Asia. It's rapidly becoming the largest single industry in the nation and should surpass even the automobile industry in the 1980s. In the U.S. alone, more than 250,000 people use 50,000 computers and data processing equipment for almost every conceivable type of job.

And more advances are on the way.

At this time, the computer industry finds itself in a paradox. It is at once the mainstay of the burgeoning information explosion and at the same time starved for information — information of all types on marketing, manufacturing, design and specialized applications.

The information is there, but, to date, no effective medium has been developed to disseminate the data quickly, concisely, and accurately. Key developments in subsystems often go unnoticed, until too late. Market opportunities are missed, because they are not known. And, possibly worst

of all, duplication abounds needlessly, resulting in wasted research and money.

Our "Computer Industry" section will fill that need.

The section will carry all of the news about subsystems used in computer and peripheral gear, in addition to all of the information about complete systems (such as terminals, memories, displays, etc.) offered on the OEM marketplace.

This section will keep systems designers alert to product advances. It will spotlight OEM for executives (new business opportunities) and provide in-depth analyses of present markets. There will also be information on competitive products and where they are being sold, as well as all of the information on the huge government market — federal, state and local.

We will also feature in-depth interviews with personnel involved in exploring new technologies or responsible for widening market horizons.

All of this information will be packaged concisely, and presented in a timely fashion. All the news available in time to use it.

For the first time, there will now be a publication that truly serves the entire range of people involved with computers and their uses — the full computer community.

And "Computer Industry" will provide a new advertising outlet to the OEM market.

For more information about how "Computer Industry" can help you, the OEM advertiser, call us here at Computerworld, Advertising Department (617) 332-5606. Or, contact the *Computerworld* representative nearest you.



COMPUTERWORLD

SYSTEMS

COMPUTERWORLD

PERIPHERALS

July 29, 1970

Page 13

Repair Centers to Fix Purchased IBM-Built Equipment

WHITE PLAINS, N.Y. — The establishment of Purchased Equipment Service Centers will enable leasing companies and their customers to have their IBM-manufactured equipment overhauled by IBM.

Previously, owners of IBM data processing equipment were limited to one-site IBM service or to the use of the reconditioning facilities of independent companies.

The service centers, the first of which is slated for opening in

Los Angeles on Aug. 1, 1970, will be equipped to recondition, modify, or repair purchased IBM-manufactured equipment. A center in the New York metropolitan area is scheduled for later this year.

Staffed by IBM's Field Engineering Division, the centers are described by IBM as better assisting customers in effectively using IBM-manufactured data processing equipment by providing them with the option of a physical location, away from

their own sites, where an IBM system or machine may receive service.

One of the functions of the centers will be the reconditioning of purchased IBM equipment. This could include IBM said, such operations as cleaning, lubrication, repair and/or replacement of parts, and testing of the equipment. The installation of essential engineering changes and the repairing of the system, including minor cover repairs, are also included.

The cost of the service would be a total charge for performing the reconditioning, based on IBM's estimate of the condition of the machine. In addition, a \$25/day charge would be levied for the use of the service facilities.

Machine modifications will be performed, IBM said, at the same hourly rate as other services, up to a \$25/day facilities charge. Modifications according to IBM, would consist of the installation and removal of system features or model conversion increments. These are restricted to the procedures that are normally field-installable.

IBM will also offer, at the owner's request, such other modifications that may be installed on-site.

Other services, such as machine improvement, will be provided at an hourly rate. The \$25/day facilities charge applies here,

too. Parts will be furnished at current prices, IBM said.

IBM's three-year warranty, including parts and labor, will apply to all equipment that has undergone reconditioning at the IBM center. This warranty does not apply, IBM said, to other service center operations.

Use of the service centers is available to IBM's lessors, owners, but also the lessors of equipment that has been purchased from IBM. Authorization from the owner of the equipment is required, IBM said.

The company also said that the level of service at the centers will be equivalent to that available to the customer at his own site. The primary advantage of the centers is that the equipment can now be reconditioned and repainted, a service previously unavailable to owners of purchased systems.

BASF Drives Compatible With 2311, 2314

BEDFORD, Mass. — Another source for plug-to-plug compatible disk equipment has opened to the user with the announcement of the 1111 disk drive and 1014 tape system by BASF Systems, Inc.

The Model 1111 drive is said to be compatible with the IBM 2311 unit, while the 1014 system is, according to BASF, an exact plug-to-plug replacement for IBM's 2314.

Both products are the result of an agreement between BASF and Century Data Systems, a subsidiary of California Computer Products, Inc. Century, the designer of the drives, has licensed BASF to sell 60-cycle drives manufactured by Century in the U.S. and to manufacture and sell the 50-cycle products throughout Europe and the rest of the world.

The 60-cycle drives will also continue to be available through the CalComp organization here.

Performance Improved

The drives are said by BASF to be plug-to-plug, software, and data compatible with the IBM units. Performance is claimed to be substantially improved

through the use of voice-coil actuators. Full-stroke head positioning time is 60 msec and a track-to-track positioning time is 10 msec, according to the company.

Increased reliability over the hard-disk solution used by IBM devices is claimed. Data transfer rate is 312K byte/sec.

The 1111 drive has been priced at \$14,000. The 1014 controller carries a price tag of \$48,500 with the 1111 drives at \$17,800 each.

Lease prices of the 1014 system are aimed at the large user, the company said. The controller and one drive are priced at \$1,450/mo on a one-year lease, with up to eight additional drives costing \$320/mo, each. Maintenance charges on the controller and first drive will add \$135/mo to the user's bill with each additional drive costing \$60/mo.

The lease price for unlimited equipment usage of the 1111 drive is \$585/mo plus \$55/mo for maintenance. Longer term leases for both models at lower cost are also offered by BASF.

Both the 1111 drives and 1014

systems are available immediately, the 1014s on a 90-day schedule and the 1111s in half that time.

BASF Systems, Inc. is at Cross Drive.

INTERNATIONAL DATA CORPORATION

Announces Completion of its
EDP Industry Outlook Study

for Corporate Planning Service Sponsors. This study examines fundamental user demand, relates it to economic indicators and utilizes the IDC Industry Model to project the computer industry's outlook for 1970-1975. Special attention is given to the current economic slowdown and impact on user spending plans.

Information about the Planning Service may be had from:



International Data Corporation
60 Austin Street
Newtonville, Massachusetts 02160

IDC is the largest market data gathering, research, and consulting firm in the computer industry.

MARKETING AGENTS

HERE IS THE OPPORTUNITY TO REPRESENT
A UNIQUE SERVICE NEEDED BY EVERY
COMPUTER INSTALLATION AND PROGRAMMING
FIRM IN THE COUNTRY. HIGH PERCENTAGE
REPEAT ORDERS. GENEROUS COMMISSIONS.

contact:

**SOFTWARE DOCUMENTATION
CORPORATION**

3560 W. PETERSON AVE.
CHICAGO, ILLINOIS 60645
312/478-8404

Pssst... don't tell the big guys

But PEC's got something they don't—delivery.



Buying a tape transport is easy. Getting "on time" delivery is something else. Impossible sometimes. To get your transports to you on time, PEC has a huge new plant producing tape transports, so you can get them when you need them. PEC makes over 200 models in three reel sizes, 9-track or 7-track, speeds from 6.25 to 37.5ips and densities from 200 to 1600cpi. In formatted or unformatted models. And you can get them fast, in OEM quantities and prices from PEC. For complete information on PEC transports, just write to Peripheral Equipment Corporation, 9600 Irondale Avenue, Chatsworth, California 91311 (213) 882-0030.



Sycor Terminal Analysis—Part IV**Six-Unit Configurations Enable User to Save Money**

By Malcolm L. Stiebel
Special to Computerworld

If the Sycor two-cassette terminal is placed in the hands of a source data terminal operator, a sales office secretary or a shipping platform supervisor, and if the source location without the terminal produces enough information to keep a keypuncher in the tab room busy two or three hours every day, then the Sycor terminal begins to save money for the user.

In this situation, the keypuncher is eliminated. In its place, the user purchases a data converter from CW (cost \$1,450/mo.) and several of the \$7,400 basic terminals scattered around the user's facilities. The operating personnel in the source locations key the data onto cassettes, verify their entries visually, and continue their normal activities.

The cassettes are picked up at the end of the day and sent to

Virtually difficulties in delivery of System 21 and its switch to a purchase-only policy have prompted a search for suitable alternatives. In this series, CW examines the Sycor terminal which can be added to System 21 in features. It also offers users the added capability of interfacing with major manufacturers' computers.

the central facility (say, the tab room) where the converter awaits. One operator pools all the cassette data from one (One 10 1/2-in. reel with 1-in. record saps and one 80-character record per block, recorded at 800 bit/in. will hold the contents of 15 completely loaded cassettes). The reel is then taken to a service bureau or to the user's own computer for processing.

A configuration consisting of

six terminals, each with two tape cassettes, and one converter, would cost \$49,500 or \$1,345/mo. This unit price would be less than the cost of two keypunch operators at current salary levels, with typical overhead added.

Such a configuration would serve a user with a tab room who uses outside computing services or one with batch-oriented computers in-house.

If the printer is needed, it should be used in a central location, like the data converter, to generate off-line listings of data on the cassettes. (Note that the converter cannot produce output to the terminal, so it can't drive the printer.)

The next major level of automation makes use of the communications option. The source data terminals are outfitted with the appropriate interfaces, and with the unattended feature. Data is captured on the cassette during the day, and sent automatically to a central office at night, where it is recorded on another cassette at a similarly equipped terminal.

To facilitate this operation; the source terminals have an answer-back feature.

The operator records the data on the computer-compatible tape recorder using an additional terminal in the central office. (Note that the communications terminal can't interface with the data converter, so a separate terminal is needed.) If he happens to be in the user's computer room, he removes the tape and mounts it for processing on the computer.

Prices

The \$5,100 type of data recorder is used, along with a group of terminals that cost anywhere from \$8,100 to \$8,500 each with a communications option and an unattended feature, with two cassettes. (Line prices range from \$227 to \$242/mo.)

Malcolm L. Stiebel is an independent consultant in the area of systems design. He has had extensive peripheral experience.

KEEP HARDWARE SALESMEN HONEST



Please send me _____ cents
Name _____
Address _____
City _____
State _____ Zip _____
Send check or money order. Include
\$2.50 plus 25¢ handling and postage for
each can.
Software Services, Inc., Suite 300, 1901
Av. of the Stars, Los Angeles, Ca. 90067

Speed merchant.



Ampex Extended Core Memory multiplies throughput on IBM 360's.

Plug in an Ampex ECM to a 360/50 and get almost twice the speed of a 2361 LCS. And even greater speed on a 360/65. Interleave two ECMs and effective throughput can be doubled again. It gives you more time to use for more data processing.

The Ampex ECM is a direct replacement for the IBM LCS. Just plug it in. Absolutely no modifications are required. Mechanically/electrically. And it is completely compatible with existing software.

And whether you lease or purchase, we'll give you complete service. All day, every day.

See for yourself. Ask for a complete list of operational sites.

For fast information, contact Ampex Corporation, Computer Products Division, 9937 W. Jefferson Blvd., Culver City, California 90230, a leading world source for core memories, tape memories, cores, stacks and arrays. Telephone: (213) 836-5000.

Your computer counts on us.

AMPEX

July 29, 1970

Page 15

NCR Battles for Local Government Contracts

By Edward J. Bride

CW Staff Writer

DAYTON, Ohio — National Cash Register Co. (NCR) is preparing for at least two battles with county or local governments who are hesitant in signing contracts.

One action has already been filed, against Erie County in western New York state. The suit seeks to force County Executive B. John Tutuska to sign a half-million dollar contract, although county officials claim the firm is only the fourth-lowest bidder for a computer

sale to the county.

In the city of Canton, Ohio, NCR has threatened legal action if Canton does not consummate a contract, which has not been certified by City Auditor Thomas L. Garrett, who said that there are no funds available; NCR is reported to contend that certification was not necessary because it was a lease, rather than a purchase arrangement.

The company also contends that the Ohio state code exempts public utilities from the necessity of an auditor's certifi-

cation. Canton's Century 100 was to be used by the city's water works.

The city council has been ordered by Mayor Stanley A. Cimich "to take whatever action is necessary to decide" the bid, although the city solicitor opined that, without an auditor's certification, a contract does not exist.

Auditor Garrett is said to be interested in another approach — data-processing, perhaps a service contract — that diverts Funds allocated for lease of computer equipment last fiscal year have reportedly reverted to the general fund and, as such, are unavailable for this transaction.

At the Erie County seat in Buffalo, N.Y., lawyers suggested that a "narrow issue" exists: who has discretion in county contracts, the county legislature or the county executive?

Executive Tutuska has ignored the legislature's authorization to acquire NCR equipment, and has proceeded with a series of purchases, he claims.

The NCR attorney, Paul Foley, said that these benchmarks were "quite obviously an afterthought," since they did not appear in the original specification.

COUNTY BUDGET DIRECTOR Louis J. Russo disagreed. He stated that the benchmarks were originally suggested by NCR, but the county could not expect to meet deadlines if it included the tests.

Russo stated that the "time constraint has now gone by to the budgets. So, we decided to have benchmarks after all, and, now [NCR] is saying it's unfair."

Russo added that the county invited all other vendors to participate in the tests and "for reasons best known to themelves, NCR declined to do so."

RCA, IBM, and Burroughs did participate.

RCA is the second-lowest hardware bidder, and has been recommended for contract approval. IBM was the third-lowest hardware bidder, but Russo explained that "we told all vendors that bids would be evaluated on the basis of 60% throughput, 30% software, and 10% support." On that basis, Russo continues, NCR came in fourth.

Russo has claimed that NCR would have started the benchmarks with an advantage because, being the low hardware bidder, "they could have been

20% worse than everyone else in benchmarks, and they still would have won" the contract.

Russo noted that "for some reason, they chose to try this out on the county, instead of in performance trials." He called the action "rather ludicrous," stating he hoped for quick disposal of the petition.

The Canton equipment was delivered in May, but has not been used. The Erie County commissioners, not officially ordered, but is "scheduled" for use in Meyer Memorial Hospital, which is operated by the county.

Maintenance Firms React To IBM Service Centers

Industry leaders had mixed reactions to IBM's announcement of Purchased Equipment Service Centers [see Page 13].

The president of Comm Corp., George O. Harmon, said the new centers "would be in direct competition with some activities of his company."

Harmon charged that the establishment of the centers by IBM "is another demonstration that IBM is only responsive to market need when it can make significant profits or eliminate competition."

"It appears to us that IBM only chose to open these purchased equipment centers," Harmon concluded, "after Comm and others opened centers and demonstrated the capability to handle this market."

The first independent firm to offer computer maintenance was Computer Hardware Consultants and Services. The president of the company, George C. Melrose, said his reactions to the IBM announcement were similar

to those expressed by Thomas J. Watson Jr., IBM chairman, in 1961.

Watson at that time said in regard to IBM's responsibilities: "Suppose that you were a competitor, small, precariously financed, without a large support organization, and about a big reputation in the field — but with a good product."

"How would you feel if the big IBM company took the action which you propose to take? Would you regard the IBM company as taking unfair advantage of your position?"

One industry spokesman speculated that in the long run IBM's centers would result in increased business for the independents.

He said that if the lessees of third-party equipment started returning their units to IBM, delivered to them to be reconditioned first, it might overtax the facilities at IBM's disposal and force the owners to use independent sources.



Stop Counting Heads and Start Counting Profits

Instead of being another "gathering of the clan," COMPSO — the Regional Computer Software and Peripherals Shows and conferences — provides an opportunity for business executives and do managers to visit and see the latest developments in computers, software and peripherals without having to spend large sums of money to travel to computer shows in distant locations.

These difficult-to-reach purchasing decision makers will attend a business-oriented computer show in a location close to their base of operations... and the salesmen manning the booth is covering his territory at the same time.

The 1971 COMPSO Series is a marketing tool that means business for you. New York Coliseum, Feb. 9-11; Anaheim (Los Angeles area) Convention Center, April 1-5; Chicago McCormick Place, Oct. 5-7. Let us help you make 1971 a profitable year. Contact Computer Exposition, Inc., 254 W. 31 St., N.Y.C. 10001, (212) 736-2301.

Bank Packages

- Mortgage Accounting
- Savings Accounting
- Installment Loan Accounting

3rd Generation COBOL Systems.
Customized to your requirements.
For IBM 360 and other major equipment.
Installed, \$10,000.

Write or call for free information, M. Arthur Gillis, Vice President

 INFORMATION SCIENCES, INC.
14 JEFFERSON BLVD., WARWICK, RHODE ISLAND 02886 (401) 877-2013

Affiliated with Industrial National Bank of Rhode Island

Pssst... don't tell the big guys

But PEC's digital mag tape transports cost less than theirs. And work better.



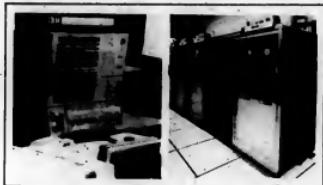
A lot less. For only \$3000 in OEM quantities, you can buy a PEC 10½ inch reel, NRZI synchronous transport, 7 or 9-track with speeds of 25, 18.75, or 12.5 ips, and densities of 200, 560, or 1000 cpi. Or maybe your system needs 1600 cpi. Just \$3740. In fact, PEC offers a complete line of transports so that you can buy a PEC 7 inch reel, NRZI transport. Compare that to the big guys' prices. And PEC transports work a lot better and are built to last longer. With simple and dependable features that give you data reliability. Year after year. For information, just write to Peripheral Equipment Corporation, 9600 Franklin Avenue, Chatsworth, California 91311 (213) 882-0030.





We invite you to contact us regarding your Computer or Unit Record Equipment Requirements.

Sales - Leasing - Purchase of Equipment
Contact Vernon Stillwell or Pat Whitmarsh
1346 Motor Court • AC 214-742-1841 • Dallas, Texas 75207



There's only ONE difference between this "second user" computer and a brand new system.

\$139,320.00

This is an IBM 360-30, owned by Computer Leasing Company and previously used by a large corporation. It will become available for lease to a new user on October 17th.

There is just one way you'll be able to tell this from a brand new 360-30... when you look at the monthly rental invoices. We'll even match the paint job on our computers.

The point is, computers don't last. And continuous manufacturing performance insures that they are kept in top condition. Big CLC doesn't sit on its laurels. When we buy a machine, we have it thoroughly cleaned inside and out and run through diagnostic routines by an independent, highly qualified service organization. When necessary, we take whatever necessary remedial action (electronic, mechanical, or "cosmetic") it is as good as new in appearance, operation and reliability.

Our monthly price has been changed . . . to protect the provident. \$139,320.00 per month, you'll save by leasing this IBM 360-30 from us for the next five years.

Because we have partially amortized its cost, CLC can lease it to you for 20% less than most other companies. Our package is the same as that offered by IBM, i.e., it includes maintenance, taxes, and insurance paid by CLC.

Any of the representatives listed below can fill in details . . . and tell you about other systems we have coming up in future months.

Computer Leasing Company
2001 Jefferson Davis Highway
Arlington, Virginia 22206 (703) 521-2900
Attn for Hayes Williams

Regional Offices:
Robert P. Frank
One Cherry Hill
Cherry Hill, N.J. 08004
(609) 467-4665
4000 World Fargo Bldg.
San Francisco, Calif. 94104
(415) 361-2898

A Subsidiary of University Computing Company

Senate One-Bank Holding Company Bill Eases Some Tough House Restrictions

CW Washington Bureau

WASHINGTON, D.C. — The Senate Banking Committee finally reported out its version of the controversial One-Bank Holding Company bill last week, and neither the banking industry nor the data processing industry will be satisfied with it.

The measure, probably one of the most heavily lobbied pieces of legislation to come out of the Congressional mill this year, must now go to the full Senate

for debate and passage and then into conference, where differences between it and the House version will be ironed out into final shape for passage.

The Senate panel's bill knocked a lot of the tough provisions out of the House version. Two items which will disturb the EDP service industry are the deletion of a section which would ban bank holding companies from engaging in non-banking activities, including the marketing of computer services, and the elimination of the House version's grandfather clause.

Instead of eliminating the list of businesses specifically prohibited to bank holding comp-

panies, the Senate bill would authorize the Federal Reserve Board to establish restrictions on activities not "functionally related" to banking, a rather vague clause.

The Senate version also would make the bill's effective date March 24, 1969, the day the first version of the present bill was introduced by Sen. John Sparkman (D-Ala.). The tougher version of the bill became effective on May 9, 1956 (the day the original Bank-Holding Company law was passed), and would have the effect of forcing one-bank holding companies to divest themselves of data processing and other non-banking activities.

360/65 & 360/67 AVAILABLE

IPS has available for sale or lease a 360/67 system and several 360/65 systems. The 360/67 is available immediately; a short-term flexible lease can be arranged. 360/65 512K systems and CPU's are available for short-term delivery with and without I/O equipment. 360/60 systems are also available for 90 - 120 day delivery. For complete information, including prices and deliveries, please write or call.

IPS (201) 871-4200
INFORMATION PROCESSING SYSTEMS, INC.
467 SYLVAN AVENUE, ENGLEWOOD CLIFFS, NEW JERSEY 07632

MEMO TO: Computer Software Companies

HAVE SALES DROPPED?

Stop this trend by becoming a NUMERAX LICENSEE. WE GUARANTEE IMMEDIATE BUSINESS.

LICENSES AVAILABLE FOR:

• Philadelphia • Baltimore • Atlanta • Miami

SPECIALIZE IN THE TRANSPORTATION FIELD

Computer Programs in Transportation,
Warehouse Location, Inventory Control,
Routing, Equipment Control, and Freight
Rate Directories.

CALL OR WRITE MR. ALLEN (201) 871-4313

NUMERAX, INC.

467 SYLVAN AVE., ENGLEWOOD CLIFFS, N.J. 07632

Calif. Parks Department, Stung Once, Still Seeks Automatic Ticket System

CW West Coast Bureau
SACRAMENTO, Calif. — The

GSA Supply Schedule Software Products Chalk Up New Records

WASHINGTON, D.C. — It is only one month into the federal government's fiscal year, and already more contracts than ever before have software products listed on the General Services Administration's Federal Supply Schedule.

An official source said that 27 companies had applied for listing in the government-procurement catalog, making it the second year record 100 applications. Last year awards were made to six companies, most of which applied for and received listing for fiscal year 1971.

The current listings are as follows: Pioneer Data Systems, Inc., Fort Lauderdale, Fla.; Applied Data Research Inc., Computation Planning Inc., Booke and Babbage Indus., Genasys Corp., and Industrial Information Inc.

Listings must be requested and granted annually, and a GSA source said that awards are soon to be made late in December or January. The catalog is updated periodically as new products or services are added.

COMPUTERWORLD SALES OFFICES

National Sales Manager

Nestle Worldwide

Sales Administrator:

Corporate Office

COMPUTERWORLD

797 Washington Street

Newark, Calif. 94560

(617) 332-5606

New England Regional Manager

Ridgefield, Conn. 06470

COMPUTERWORLD

797 Washington Street

Newark, Calif. 94560

(617) 332-5606

Mid-Atlantic Regional Manager

Donald E. Fegan

COMPUTERWORLD

Suite 4C

120 East 34th Street

New York, N.Y. 10016

(212) 532-1790

Phila.-Wash. D.C. District Manager

John Cummings

COMPUTERWORLD

Suite 510

502 15th Street, N.W.

Washington, D.C. 20036

(202) 466-2630

Midwest Regional Manager

Bill Ferrell

COMPUTERWORLD

Suite 21B

25 East Chestnut

Chicago, Illinois 60611

(312) 944-5385

Southeast Regional Manager

Ed O'Farrell

COMPUTERWORLD

Stammons Tower West

3725 Stemmons Freeway

Dallas, Texas 75207

(214) 338-1140

Los Angeles Area:

Bob Byrne

Sherwood/Byrne/Carlson/

Venture Inc.

1017 N. LaCienega Blvd.

Los Angeles, Calif. 90089

(213) 637-4521

San Francisco Area:

Bill Heyay

Thompson-Heyay Assoc.

1111 Market Street

San Francisco, Calif. 94103

(415) 362-8547

Japan:

Mr. Miyazaki Ando

Fuji Corporation

3-1, S-Chome, Yoyogi

Shibuya-Ku, Tokyo, Japan

California State Department of Parks and Recreation is once again receiving bids on a computerized reservation system for its parks and Hearst Castle. The department is in the midst of legal action between the state Attorney General's office and Computer Science Corp. over CSC's cancellation without notice of its CompuTicket operation.

Forty firms have expressed interest in submitting bids. In addition to reservation companies, bidders include software houses, service bureaus, and computer firms. The reservation system involves a central computer and a network of more than 70 terminals. Installation date is December 15, to be followed by a two week test period with public use being initiated on January 2, 1971.

sufficient advantages to try computers again.

The main advantage is that campers can go to a nearby campin location and receive instant information of available sites instead of waiting for a reply by mail.

Forty firms have expressed interest in submitting bids. In addition to reservation companies, bidders include software houses, service bureaus, and computer firms. The reservation system involves a central computer and a network of more than 70 terminals. Installation date is December 15, to be followed by a two week test period with public use being initiated on January 2, 1971.

\$33,000 Saving For 360/40 Users

(Or Computer Leasing Companies)

You can save \$33,000 if you are upgrading from a 360/40H (128K) to a 360/40H (256K) by purchasing the IBM 128K core upgrade from Dataware. Available August 1st.

Order by phone (415) 989-6580

Dataware MARKETING, INC.
Subsidiary of Booth Computer Corporation

Our
August 26
Environment
Supplement.
Devoted
to the
care and
feeding
of
computers.



Computerworld's Environment Supplement

will feature these topics:

- Efforts to minimize noise, control temperature and humidity
- Internal Control programs (personnel responsibilities, facilities planning, etc.)
- Specialized flooring and computer room planning and design
- Management responsibilities for guarding data resources
- How vulnerable are your data files? — to vandalism, fire, sabotage, theft, etc.
- The Computer Center — How secure is it?

When your ad appears in our *Environment Supplement*, over 35,000 paid subscribers will be exposed to it — more paid readers than any other computer publication. And they're well-educated readers, too. 18,500 of them are Top System Executives. Better known as the primary buying influence of computer products and services. And you reach everyone at the lowest CPM of any computer-oriented publication.

Feed your sales with a carefully placed ad in our *Environment Supplement*. Closing is Aug. 7.

For more details, call the Computerworld representative nearest you.



COMPUTERWORLD
THE NEWSMAGAZINE FOR THE COMPUTER COMMUNITY

Computerworld's SALES OFFICES

National Sales Manager
Neil Wicker
Sales Administrator:
David C. Fagan
COMPUTER R/WORLD
797 Washington Street
Newton, Mass. 02160
(617) 332-5603

New England Regional Manager
Peter J. O'Farrell
COMPUTER R/WORLD
797 Washington Street
Newton, Mass. 02160
(617) 332-5603

Mid. Atlantic Regional Manager
Donald E. Fagan
COMPUTER R/WORLD
Suite 4C
120 East 34th Street
New York, N.Y. 10016
(212) 632-1790

Phil.-Wash. C.D. District Manager
John Cummings
COMPUTER R/WORLD
Suite 510
2021 "L" Street, N.W.
Washington, D.C. 20036
(202) 466-2630

Midwest Regional Manager
John F. Murphy
COMPUTER R/WORLD
Suite 218
25 East Chestnut
Chicago, Illinois 60611
(312) 944-5885

South Regional Manager
Ed Grelle
COMPUTER R/WORLD
Stevenson Tower West
2730 Stevenson Freeway
Dallas, Tex. 75207
(469) 744-1140

Los Angeles Area:
Bob Byrne
Sherwood/Byrne/Carlson/
Vann & Assoc.
1011 N. La Jolla Blvd.
La Jolla, Calif. 92098
(619) 657-6221

San Francisco Area:
Bill Healey
Thompson/Hess Assoc.
1111 Hearst Blvd.
San Francisco, Calif. 94103
(415) 362-8547

Mr. Naoyoshi Ando
Fuji Corporation
3-1, 5-Chome Yoyogi
Shibuya-Ku
Tokyo, Japan

Position Announcements

Director of Data Processing

for a community college serving 18,000 students in northwest suburban Chicago. Responsible for all phases of administration, data processing and supervision of the educational program in data processing. Salary based upon training and experience. Send resume to:

Forest D. Ehmerer, President
McHenry County College
6200 Northwest Highway
Crystal Lake, Illinois 60014

SCIENTIFIC APPLICATIONS ANALYST

Large Midwest manufacturer requires individual to work with middle management and technical personnel in development of applications software for scientific and industrial systems for solution of technical and business problems. Prefer advanced degree in applied science or computer science with extensive experience in scientific programming or management/sciences techniques.

Starting salary is commensurate with your background and work experience. Complete company benefits, including a stock savings plan.

Send your confidential resume to:

Career Center
Box 329
40 Austin St.
Newton, Mass. 02160

An Equal Opportunity Employer.

Buy Sell Swap

For Sale

IBM 7094

32K, 3 date channels, 800-bit density. Make offer. For details call:

Robert Solberg
206-931-3511

The Boing Company
Seattle

COMPUTER PROFESSIONALS

Our client companies, with operations throughout the U.S., have current requirements which include:

- V.P. Marketing — To 30K
- Director Mktg. — To 25K
- Manager Software Development — To 24K
- Computer Sales Mgrs. — To 23K + Bonus
- Systems Programmers — To 21K
- Design Engineers — To 20K

Send resume or call (collect)

Callahan

CENTER FOR
COMPUTER PROFESSIONALS

1405 Locust Street, Suite 1616
Philadelphia, Pa. 19102
(215) 985-1700

If you desire a FREE copy of the unique booklet "How Do You Compare with Your Computer Peers?" fill out the coupon below.

Name _____
Address _____
City _____
State _____

WANTED MFG. REPS.

Major metal stamping and cabinet manufacturer looking for reps. in many areas. In-house capability to paint all finishes and electroplate. Fast quotations, competitive pricing. Suckle Corporation — Suckle & National Hwy., Pennsauken, N.J. Tele: 215-225-2900 — Call Collect

CASH DEAL

IBM 1401 WANTED

By private party. System must include one 131 disk drive and one IBM monitor. Submit list of hardware features and your Lowest Price to:

P.O. Box 5083
Santa Monica, Calif. 90405

360/20

FOR SALE OR LEASE

Owner wishes to sell or lease 360/20 C1 K8 card system with 2560, 2203, 2501 for immediate delivery. For complete specs and prices please write

Box 3229
60 Austin St.
Newton, Mass. 02160

ACS

WANTED

360 Models 30, 40, 50

1401 Tape or Disc Systems

SALE OR LEASE

128K 360 Model 40

029's, 083's, and 088's

ACS COMPUTER SYSTEMS
3478 Young Street, Suite 100
Austin, Texas 78701
(512) 448-4301

LARGE SELECTION

of IBM Keypunch Machines

Model 024 and 056

All under IBM maintenance

No reasonable offer refused

(212) 661-4370

FOR SALE

PDP-9 System with K090A, M09B, K09A, K09B, CR038, 0897A, plus

internal memory, 121K, 231K, 230K, 230S and 2311

PDP-8/ID System with

K090A, K09B, K09C, K09D, T021, T020, T020A, H-961 A and 2 TU 851

PDP-8/LE System with BAOA

and MC8/LA

TELETYPE — Model ASR33

Available immediately. Lease or rental terms can also be provided. Please consider setting up contracts.

TELEPHONE: 617-227-4856

SUBSCRIBE TO COMPUTERWORLD

FOR RENT

1316 DISK PACKS

90 DAY LEASE — \$5.75 MO.
1 YEAR LEASE — \$5.00 MO.

PACKS AVAILABLE NOW

CALL COLLECT

(603) 865-8125

J. Poppenheimer

**Before you buy,
sell, or lease
any computers
or peripherals...**



**We can save
you money.**

**Call or write:
B-C Computers.**

15950 Armada St., Van Nuys
Calif. 91408 (213) 873-4073

407 A-1

TAB MACHINE

005 & 097

COLLATORS

SALE OR RENTAL

On IBM M/A
ALSO

024, 046, 056, 059

082, 014, 519, 548

559, 563, 567

582, 583 DRIVES

• TAPE DRIVES

• 360 SYSTEMS

• IBM DATA PROCESSOR

383 Lexington Ave., NYC 10003

(212) 673-9300, Ext 10

FOR SALE

IBM 402 A-1

IBM 514 001

Under MAI Maintenance

Will Ship Separately

BARBY ELECTRONICS

P.O. Box 2

READING, PENNA. 19603

COMPUTER ACQUISITIONS CO.

WANTS

• COMPUTERS, ALL MAKES

• UNIT RECORD EQUIPMENT

SELLS

(404) 458-4415 BOX 29185

ATLANTA, GA. 30329

COMPUTER ACQUISITIONS CO.

FOR SALE

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Mountain View, Calif. 94040,

Phone — 415-967-6973

UNIVAC 1004 C 1K

PROCESSOR & PUNCH

(In: Boards & Wires)

Contact M.L. Williams

P.O. BOX 100

Management and DP Personnel both benefit from GENERAL RETRIEVAL SYSTEM and GENERAL MAINTENANCE SYSTEM

hundreds of users names on request

Information Science Incorporated

Don't Install 2260's

(for any other key-driven terminal)
without
GRAPHICS
a complete software package

turnkey systems inc.
one eleven east avenue
Norwalk, Connecticut 06851
(203) 838-4581

Information Retrieval and File Maintenance

On-line, high-speed.

On-Line Retrieval - Use and/or not, etc., to compose requests. Answers provided instantilly.

On-Line File Maintenance: Change existing records, add new records, directly or via one terminal.

Variable-Length Records: All records consist of a variable number of variable length fields.

Display Terminal: IBM 3260, 2260 displays terminals. Other terminals also supported.

Easy to Learn: Non-programmers can learn to use the system in a few minutes.

On-Line Format Specification: Display only the information you really want to see.

Cross References: Several files may be stored and cross referenced directly from terminal.

Cross Tabs: Cross tabs and other reports may be requested from terminal.

All info is available from Computer Corporation of America or 2 Model 103 for IBM 360/ DOS and Model 104 for IBM 360/ OS.

Write us for information. And specify which model you're interested in.

And if you're interested in the half-processing mode of operation, specify that, too.

Our address is: Technology Square, Cambridge, Massachusetts 02139

Computer Corporation of America

Software for Sale

infomacs

The incredible new report generator and file creator that revolutionizes report writing and live test file generation.

Load and Go Environment

DISK-TAPE
Sequential Input
Variable Fixed
• Control card manager
• Learned in Immediate
• 16 levels of nesting
• More than 4000 lines
• Output: Edited Report
 File
• Previous... Entire file
• Previous... Last n records

Create selection test file.
Line input file

• Maximizes testing environment

• Reduces test time

One-Time Reporting

• Produce report outputs

• No more special programming project

Write for new 1970 technical data and operating instructions, free demonstration and pricing information.

macs

datamacs

The incredible new test data generator that completely revolutionizes the normal procedure of creating test data.

Load and Go Environment

Creates all types of files

DISK

- Sequential
- Index Sequential
- TAPE

• Variable

• Fixed

Data generated for each field

- Constant/variable values
- Sequential values
- Random numbers
- Clusters
- Computational
- Mix - All of the above

Write for new 1970 technical data and operating instructions, free demonstration and pricing information.

macs

104 Park Avenue Plaza East
Philadelphia, Pa. 19130
215/470-4203

FASTBALL

THE COBOL SOURCE STATEMENT GENERATOR SUPPORTS:

Disk
File Creation/Copies
Tape
File Updates

Reports, plus Summarization
Card Punch
Input/Output Files
Card Reader
Etc., Etc., Etc.,

Write a Cobol program on one sheet of paper in 15 minutes. Then enter it into the system. Write, edit, and re-enter in Cobol. Source statements provided. Only \$3,000.00 customized.

WRITE TODAY FOR LITERATURE.

WANTED: Marketing Representatives. ALSO: Will Market other Products.

Mr. Richard C. Brown
BROWN BROS. ENTERPRISES
509 Fuller Ave., N.Y.
Greenwich, Conn. 06830
Phone 616/458-2349

Computer Power

Teleprocessing systems tailored to any terminal environment:
• 2560 up to 10K IN/OUT
• ONLINE Entry
plus Language Conversion and disk storage packages meet your information management requirements

Computer Power
101 Park Avenue N.Y. 10017
(212) 889-0550

60 Payroll System - 100% COBOL

Series of 23 programs which process hourly and salaried payrolls in a variety of formats with full labor deduction capabilities. Full labor distribution reporting. Complete file processing. Includes payroll documentation. Runs on IBM 360 and 370, CDC 6400, and DEC 20 and 30. This system is now being used and has proven to be reliable.

PRICES: \$5,000.

Automated Financial Systems
Incorporated
One Decker Square
Bala Cynwyd, Pa. 19004

*ACCOUNTS PAYABLE

*GENERAL LEDGER

*ACCOUNTS RECEIVABLE

*JOB COST



MANUFACTURING MANAGEMENT SCIENCES, INC.

5/360 - 25 AND UP

• ALL INSTALLED

• WE DESIGN AND MAINTAIN

• WE GUARANTEE

MANUFACTURING MANAGEMENT

SCIENCES, INC.

275 CAMBRIDGE ST.

BURBANK, MASS. 01803

617/272-2970

CDC TO IBM FORTRAN AUTOMATIC CONVERSION

Translates CDC programs into a standard Fortran for 360, 1BSYS etc at a cost of only 10 cents/card.

SOFTWARE STANDARDS

4401 Kessick Road
Bel Air, Md. 21210
301/235-2550

1130 PLOT

Low cost system plots up to four curves simultaneously on a 1130 printer. Special typehead includes 15 dots and 15 crosses positioned in a 3 x 5 raster which yields a plotting precision of about one-third inch.

- Automatic Scaling
- Grid Lines
- Optional Titles and Legend
- Red and Black Points

Call or Write:

TPLOT, Inc.
55 Mitchell Blvd.
San Rafael, Calif. 94903
(415) 472-2211

6K COBOL CROSS-REFERENCE

Now available to 360 DOS users, a 6K COBOL CROSS REFERENCE that provides a sequential listing of all programs and their uses. This program uses a maximum of 25 cylinders of a 2311 or 2312 to handle up to 10,000 programs and nearly 7,500 to 10,000 source cards. Execution time is extremely fast. 6K stored in memory, 10K read in, 4MB stored out. Nothing like it.

Price: \$200.00

AMERICAN COMPUTER LEASING
ONE EAST FOURTH STREET
CINCINNATI, OHIO 45202
(513) 579-2211

UPTIME FILE MANAGEMENT AND REPORT GENERATOR

Write reports in minutes, create and update any file using a simple, but powerful free form English language 25 times faster than COBOL. Currently operational.

IBM 360, Univac, RCA
Price \$300.00

PAYROLL

Multi-branch, hourly and salary, all state and local taxes, generates all corporate and government reports. Currently operational. Thoroughly documented in a clear cut manner. Available for IBM 360 and H-200.

Price \$6,000

AUTOMATED INFORMATION SYSTEMS, INC.

1 Padavan Road
Denbury, Connecticut 06810
(203) 744-6500

DNA SYSTEMS, INC.

announces

IBM 1130 DISK SORT

Fast & Flexible...

Files:

Sorts FORTRAN & RPG sequential and direct access, FX or WS.

Sorts files in place or into separate output files.

Sorts and merges new data with pre-sorted file (optionally).

Sorts up to 430,000 records, single or multi-record, 500K, 1M, 2M, 4M.

Sorts and merges new data with pre-sorted file (optionally).

Sorts and merges new data with pre-sorted file (optionally).

... single and double integers, part word binary, float (1-32 bits), A1, A2, A3, A4, A6, D1, D4

... RPG A2 and RPG packed

... Floating point, standard & extended precision . . .

DNA SYSTEMS, INC.



510 W. Stewart Avenue
Elgin, Ill. 60120
312-299-4022

Specializing in 1130/1800 Software and Systems Services

Now, no more waiting for a slow printer to finish a report, or for a quick fix. Introducing 1130 NOWPOWER, an exclusive innovation from DNA, lets you interrupt any job and resume it later. NowPOWER automatically restores and resumes your original program. Does it accomplish all this? Available immediately.

Write Us, Or Phone: 312-748-2900

DMD

data for management decisions inc.

22335 Governors Hwy.
Richton Park, Ill. 60571

SOFTWARE SPECIALISTS

Computer programs are worth cash to the programmer/analyst who has developed a reliable system which is debugged and ready for the market place.

In the last 6 months our company sold 68 packages, worth more than \$250,000 to major companies from coast to coast.

If you have software which can be marketed we will compensate you handsomely.

Call or write for details of our plan.

D.G. Webster, President

Webster Computer Corporation

1 Padavan Road
Denbury, Connecticut 06810
(203) 744-6500

July 29, 1970

Page 21

Bennett Out at Viatron, Hunt Named Chairman

BEDFORD, Mass. — There's one thing nobody denies that Viatron makes, and that's news.

The latest installment of *System 21 Faces Life* shows a majority of the board of directors replacing Dr. Edward M. Bennett as chairman. Dr. Peter J. Phillips, formerly vice-president and general counsel of the company, becomes acting president.

Prof. Pearson Hunt of the Harvard Business School and a director of Viatron is replacing Bennett as chairman of the board. Dr. Joseph Spiegel, formerly vice-president and general counsel of the company, becomes acting president.

Commenting on the shake-up, Bennett said it was a "stunning experience." He asked jokingly: "What did they see in the job that attracted them?"

Bennett said Spiegel said they had no plans to regain control of the company in the immediate future.

Bennett described the board meeting, which took place in his living room, as "not acrimonious at all." He said he was surprised by the changes. "He said he was taken by surprise and that particular causes for the changes were not discussed at the meeting."

He ascribed his firing to "an evolving divergence of attitude" between those involved with the day-to-day management of the company and the rest of the board.

Bennett and Spiegel expressed confidence in Viatron's future and its new management. Spiegel said: "I will do nothing in any way to injure or hurt" Viatron.

Bennett also noted that it was his own decision to leave the board and that he has no personal obligation to Viatron to provide technical assistance and support the new management.

No one connected with Viatron would discuss the substantive issues involved in the change.

A member of the faculty of the Harvard Business School since 1940, Hunt has served as a financial planning consultant in the U.S., Spain, Italy, and England. Among his clients were General Telephone and AT&T.

Bennett will become "technical advisor to the president" while continuing as a director. Spiegel remains a director.

In addition, Robert Dockser, former president of Viatron Programming, a subsidiary, was



Pearson Hunt

elected senior vice-president of the firm.

There was speculation among Viatron observers that the change was based on disagreement over the fiscal policies of the company.

The stock market reacted to the news by dropping the price of Viatron common from 7-7/8 to 5-1/2, a bid, a new low for the company.

Viatron's recently released second quarter financial statement revealed that the company was still stalled in its attempt to become "the GM of electronics," and still suffered from acute deficits. Viatron stock has been depressed for the last few months.

Honeywell Earnings Up 6%

MINNEAPOLIS — Besides announcing a 10% rise in revenues and a 6% gain in earnings for the second quarter, Honeywell Chairman James H. Binger also revealed that the new company that will take over combined Honeywell and General Electric computer operations has been incorporated and a proxy statement involving the combination will be mailed to shareholders early in August.

The new company is named Honeywell Information Systems Inc.

Binger also said "very satisfactory progress" is being made in the attempts to combine the Honeywell-GE operations.

For the second quarter Honeywell reported revenues of \$381.3 million, up from \$346.4 million a year ago.

Earnings for the quarter amounted to \$15.1 million, an increase of 6% over the same quarter of 1969 when earnings amounted to \$14.2 million. Per share earnings were 96 cents for the quarter on a larger average number of shares outstanding

compared with 95 cents last year.

Second quarter brought Honeywell's six-month sales to \$746 million, compared with \$671.4 million a year ago, and earnings to \$28.9 million, up from \$26 million last year, providing gains of 11% in both cases. Honeywell had earnings per share increased to \$1.86 from \$1.75 a year ago.

Binger said Honeywell's worldwide computer business "continues to grow at the high rate that we have previously noted. June was particularly strong in this area." The company's Order Index is excellent and bookings are at record highs. We are particularly gratified by the favorable response to new products.

The Honeywell chief executive reported that in the residential and larger building market the company's business was mixed. "The low level of housing starts in the U.S. continues to be a factor," he said, "although there are some signs that an upturn may be in sight. Billings and margins so far are holding up well."

"Brownout warnings spell gloom for DP installations"

Consider this. Typical computer specifications require a power input range of -8% to +10% of voltage, and a frequency stability of $\pm \frac{1}{2}$ Hz. Typical fluctuations greater than 10% for as much as $\frac{3}{4}$ Hz are regularly experienced by leading utilities. If undetected, these fluctuations can cause computer errors resulting in costly down time and program reruns.

The Airoyal System Monitor provides visual and audible warnings of any deviation in power (as well as in temperature and humidity, optionally) and fixes the time of fluctuation on a digital clock. The cost is generally recovered the first time the horn blows. For complete information, send for our catalog.



AIROYAL
MANUFACTURING CO.

19 Gliona Lane, Fairfield, N.J. 07006 • 201 227-4290

Summer Special LOWEST RATES EVER AT E.P.G.

CONFIGURATION

360/50	— 512K	2	— High Speed Printers
8	— 9 Track tape drives	1	— 2540 Card Read/Punch
2	— 7 Track tape drives	1	— 2501 Card Reader
1	— 2314 Direct Access	1	— 2701 Communications Control
	Storage Device	1	— 2780 Terminal
4	— 2311 Disk Drives	1	— 2780 Terminal

OS-MVT, MFT-II, HASP,RJE

FREE OPERATORS
TECHNICAL SUPPORT

ALSO: Systems / Programming 3D Keypunch Machines
360 Operations & Programming classes Sysgens Remote
Job entry capabilities

CALL:

TED SABARESE at (212) 826-0660
Vice-President

epg

COMPUTER SERVICES
INCORPORATED

345 Park Avenue, New York, New York 10022

Public Service Announcement

In case you missed it...

SYSTEMS

COMPUTERWORLD

PERIPHERALS

July 6, 1979

Page 2

Model	Altos New York Computer Corporation	MAI Verbatim	Western Systems	Sierra Pacific	Videotronics
Terminal	Standard RS232-C Parallel DIN	Standard RS232-C Parallel DIN	Standard RS232-C Parallel DIN	Standard RS232-C Parallel DIN	Standard RS232-C Parallel DIN
Modem	None	Up to 2,400 baud (optional) None	None	Up to 1,200 baud (optional)	Via optional converter and interface cards
Keyboard	None	None	None	Optional stand- alone printer	Via optional converter and interface cards
Printer	Parallel Print Wheel Terminal or Single Station, No Optional	\$20,700	\$6,000	\$62,167	\$6,000
add-ons and peripherals for dif- ferent applications: color terminal, where available					

*The price per station decreases as the number of terminals increases.

a data bus, which also interfaces with the computer's memory.

disk, tape,

recorder heads and

commercial stereo sets, differing

in characteristics of the

disk, tape,

recorder heads and

commercial stereo sets, differing

in characteristics of the

For immediate delivery call your nearest VIATRON dealer.

Atlanta, Georgia
Universal Computer Techniques, Inc.
1077 Amherst Circle, N.E.
2510 Peachtree Road, N.E.
Tel. (404) 575-0204

Baltimore, Maryland
Altos New York Computer Corp.
1028 Hazel Place
Baltimore, MD 21201
Tel. (301) 855-7448

Bellville, Washington
Universal Computer Techniques, Inc.
12310 10th Street, N.E.
Seattle, WA 98105
Tel. (206) 455-1407

Birmingham, Alabama
Universal Computer Techniques, Inc.
1208 Eighteenth St., So.
Tuscaloosa, AL 35403
Tel. (205) 268-5425

Boston, Massachusetts
Universal Computing Sciences Corp.
200 Brattle Street
Cambridge, MA 02138
Tel. (617) 492-5780

Bronx, New York
Universal Computer Techniques, Inc.
1 New England Executive Park
Bronx, NY 10462
Tel. (212) 272-2545

Buffalo, New York
Computer Group, Inc.
600 Main Street, Bldg. 2021
Buffalo, NY 14202
Tel. (716) 834-5805

Casper, Wyoming, Middle
Computer Associates
819 Pine Tree Drive
Torrance, CA 90505
Tel. (310) 577-5205

Chicago, Illinois
Universal Computer Systems, Inc.
1101 West 22nd Street
Evanston, IL 60201
Tel. (312) 828-8021

Computer Industries
1000 University Street
Seattle, WA 98101
Tel. (206) 464-3865

Cupertino, California
Universal Computer Techniques, Inc.
9899 Marconi Avenue
Cupertino, CA 95014
Tel. (408) 278-5840

Cleveland, Ohio
Universal Computer Systems, Inc.
11740 Cuyahoga Blvd.
11740 Cuyahoga Blvd.
Tel. (216) 478-5840

Dallas/Fort Worth, Texas
Universal Computer Systems, Inc.
6300 Stemmons Freeway, Suite 332
Dallas, TX 75209
Tel. (214) 855-0705

Denton, Texas
Universal Computer Corporation
2828 Springdale Road
P.O. Box 1000
Denton, TX 76204
Tel. (817) 384-0465

Des Moines, Iowa
Universal Computer Corporation
2000 Springdale Road
P.O. Box 1000
Des Moines, IA 50320
Tel. (515) 284-0465

Detroit, Michigan
Universal Computer Systems, Inc.
18650 W. Ten Mile Road
Tel. (313) 229-2275

Duluth, Minnesota
Proxit Computer Industries
17209 W. Ten Mile Road
Tel. (612) 481-8675

Edmonton, Alberta
Universal Computer Techniques, Inc.
1409 West 10th Street
Calgary, AB T2M 1G2
Tel. (403) 265-5427

Fort Wayne, Indiana
Card, Inc.
1000 North Main Bldg., Suite 500
Fort Wayne, Indiana 46802
Tel. (219) 424-2200

Huntington, West Virginia
Hunter Corporation
4031 West River Drive
Charleston, WV 25301
Tel. (304) 548-3100

Gainesville, Florida
EDP Associates
1707 Green Street
Gainesville, FL 32603
Tel. (904) 372-5573

Greenville, South Carolina
Universal Computer Techniques, Inc.
Programmable Devices Corp.
7851 Bellmead, Suite 15420
Memphis, TN 38115
Tel. (615) 727-5119

Greenville, South Carolina
Universal Computer Techniques, Inc.
Programmable Devices Corp.
7851 Bellmead, Suite 15420
Memphis, TN 38115
Tel. (615) 727-5119

Hartford, Conn.
COMTRAC
1100 Main Street
Danbury, CT 06810
Tel. (203) 743-1000

Houston, Texas
General Space Corp.
1100 Main Street
Houston, Texas 77008
Tel. (713) 654-1000

Indiranagar, Bangalore, India
Amansoft, Inc.
100 Mahatma Gandhi
Indiranagar, Bangalore, India
Tel. (080) 46220
Fax. (080) 46220

Kansas City, Missouri
Central Industries
1000 Main Street
Kansas City, Mo. 64108
Tel. (816) 421-3633

Lakeland, Florida
Digital Systems Corp.
1000 Lakeland Center
Lakeland, Fls. 33803
Tel. (813) 646-5757

Lima, Ohio
Card, Inc.
1000 North Main
Erie, Ohio 43407
Tel. (419) 331-3670

Long Beach, California
Southwest Resources International, Inc.
8700 Atlantic Avenue
Long Beach, CA 90806
Tel. (213) 390-5511

Los Angeles, California
Southwest Resources International, Inc.
8700 Atlantic Avenue
Long Beach, CA 90806
Tel. (213) 390-5511

Madison, Wisconsin
Southwest Resources International, Inc.
8700 Atlantic Avenue
Long Beach, CA 90806
Tel. (213) 390-5511

Minneapolis, Minnesota
Southwest Resources International, Inc.
8700 Atlantic Avenue
Long Beach, CA 90806
Tel. (213) 390-5511

Montgomery, Alabama

Montgomery, Alabama
Universal Computer Systems Corporation
1000 Aviation Drive
Los Angeles, CA 90064
Tel. (213) 473-2275

Montgomery, Alabama
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Montgomery, Alabama
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Montgomery, Alabama
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Miami, Florida
Card, Inc.
1000 North Main
Erie, Ohio 43407
Tel. (419) 331-3670

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Minneapolis, Minnesota
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Montgomery, Alabama
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Oklahoma City, Oklahoma
Computer Congregations Corporation
1000 N.W. 10th Street
Oklahoma City, OK 73104
Tel. (405) 235-2275

Oklahoma City, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Oklahoma City, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Olympia, Washington
Source Resources International, Inc.
Capitol Hill, Seattle, WA 98103
Tel. (206) 467-5162

Philadelphia, Pennsylvania
National Information Systems
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Phoenix, Arizona
Arizona Terminal Systems Co.
2333 E. Camelback Rd., Suite 400
Phoenix, AZ 85016
Tel. (602) 954-2205

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Philadelphia, Pennsylvania
Management Computer Services, Inc.
1000 South Broad Street
Philadelphia, PA 19107
Tel. (215) 625-5400

Pittsburgh, Pennsylvania
Universal Computer Techniques, Inc.
4200 Hanover Street
Palo Alto, California 94304
Long Island City, NY 11101
Tel. (212) 738-5941

Tulsa, Oklahoma
Computer Congregations Corporation
11211 South Lincoln
Oklahoma City, OK 73104
Tel. (405) 235-2275

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

Tulsa, Oklahoma
Universal Computer Techniques, Inc.
11211 South Lincoln
Los Angeles, CA 90064
Tel. (213) 738-5941

VIA TRON INTERNATIONAL OFFICES
VIATRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

VIA TRON Computer Systems S.A.
Montevideo, Uruguay
Avda. Presidente Jose Gervasio Artigas 36,
3rd floor, Montevideo
Tel. (011) 200-5510

For further information, write VIATRON Computer Systems Corporation, Dept. CW-729, Crosby Drive, Bedford, Massachusetts 01730. Tel. (617) 275-8100.

VIATRON SYSTEM 21

The standard of the '70's

*Certified by VIATRON to provide customer training on System 21.